U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-255 143

EVALUATION OF THE WYOMING WATER SUPPLY PROGRAM

Environmental Protection Agency

December 1972

BIBLIOGRAPHIC DATA SHEET	1. Report No.	2.	3. Recipient's Accession No. PB-255 143
4. Title and Subtitle Evaluation of the Wyoming Water Supply Program.			5. Report Date Dec 72
			6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address Environmental Protection Agency, Denver, Colo. Div. of Air and Water Programs			10. Project/Task/Work Unit No.
			11. Contract/Grant No.
12. Sponsoring Organization Name and Address			13. Type of Report & Period Covered
			14.

15. Supplementary Notes

16. Abstracts

In-depth studies of the public, semi-public, and individual water supplies were conducted in Campbell, Lincoln, and Natrona Counties. These counties were selected because each had different types of water sources and surveillance. A total of 23 public, 13 semi-public, and 127 individual supplies were surveyed in the three counties. Bacteriological and chemical qualities of the supplies were judged on the basis of the 1962 U.S. Public Health Service Drinking Water Standards.

In addition, the adequacy of the Water Supply Program was evaluated on the basis of surveillance activities, laboratory resources, policies, legislation, budget, and manpower.

17. Key Words and Document Analysis. 17a. Descriptors

*Water supply,
Water quality management,
Wyoming,
Potable water,
Water pollution,
Regulations,
Government policies,
Fluorides,
Monitoring,
Public health,
Biochemical oxygen demand,
Water analysis.

17b. Identifiers/Open-Ended Terms

Campbell County (Wyoming),
Lincoln County (Wyoming),
Natrona County (Wyoming).

17c. COSATI Field/Group 13 B

18. Availability Statement National Technical Information Service Springfield, Va.	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 223
	20. Security Class (This Page UNCLASSIFIED	22. Price $7.75/$2.25

PB 255 143

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

EVALUATION
OF THE
WYOMING WATER SUPPLY PROGRAM

Water Supply Branch
Air and Water Programs Division
Environmental Protection Agency
Region VIII

December, 1972

ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
SUITE 900 1860 LINCOLN STREET
DENVER COLORADO 80203

Re: 8A-AWS

Dr. Lawrence J. Cohen, Administrator
Division of Health and Social Services
Department of Health and Social Services
State Office Building
Cheyenne, Wyoming 82001

Dear Dr. Cohen:

We have completed the evaluation of the Wyoming Water Supply Program, as requested by Mr. Arthur E. Williamson in his letter of January 27, 1971. A report is submitted now.

The evaluation conducted by our Water Supply Branch, included a study of drinking water supplies in three counties, and a detailed assessment of the State's activities concerning drinking water. The report presents the findings of the evaluation as well as recommendations which are necessary to give Wyoming an effective Water Supply Program.

The full cooperation and assistance received is appreciated. You and your staff are to be commended for your interest in the importance of providing an adequate supply of safe drinking water for all Wyoming's residents and visitors. If we may be of assistance in achieving this goal, please contact my office.

Sincerely yours,

John A Green

John A. Green
Regional Administrator

Enclosure

ACKNOWLEDGEMENTS

The assistance and cooperation of the following people and their respective staffs are acknowledged gratefully:

Mr. Arthur E. Williamson, Director, Sanitary Engineering Services - Wyoming Department of Health and Social Services.

Mr. Robert Coffman, Director, Environmental Surveillance and Control Services - Wyoming Department of Health and Social Services.

Mr. Nix Anderson, Director of Environmental Health - Casper-Natrona County Health Department.

Mr. Don Hansen, County Supervisor, Lincoln County - Farmers Home Administration.

A special thanks is expressed to all residents, waterworks personnel and community officials who provided information and generously cooperated in the study.

THE MENTION OF PRODUCTS OR MANUFACTURERS IN THIS REPORT DOES NOT IMPLY ENDORSEMENT BY THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY.

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SUMMARY

Approximately 246,000 people in Wyoming are served by 107 public water supplies. The remaining 86,000 residents obtain their drinking water from semi-public or individual systems. The semi-public systems at restaurants, campgrounds, recreational areas, and trailer parks, in addition to the public supplies, also serve the estimated six million tourists who visit Wyoming each year.

In view of the importance of safe and adequate supplies of drinking water, Arthur E. Williamson, P. E., Director, Sanitary Engineering Services, Wyoming Department of Health and Social Services, requested the Water Supply Branch, Environmental Protection Agency, Region VIII to evaluate the State's Water Supply Program.

In-depth studies of the public, semi-public, and individual water supplies were conducted in Campbell, Lincoln, and Natrona Counties. These counties were selected because each had different types of water sources and surveillance. A total of 23 public, 13 semi-public, and 127 individual supplies were surveyed in the three counties. Bacteriological and chemical qualities of the supplies were judged on the basis of the 1962 U. S. Public Health Service Drinking Water Standards.

In addition, the adequacy of the Water Supply Program was evaluated on the basis of surveillance activities, laboratory resources, policies, legislation, budget, and manpower.

The principal findings of the study are summarized below:

Public Water Supplies

1. Thirty-three percent (33%) of the 107 public water supplies failed to meet bacteriological quality standards for one or more months during 1971. These systems serve approximately 32,500 people.
2. Of the twenty-three public water supplies studied:
   a. Nine percent (9%) failed to meet mandatory chemical drinking water limits. These systems serve about 3,230 people with water that could cause adverse health effects.
   b. Thirty-five percent (35%) failed to meet recommended chemical drinking water standards. These systems serve approximately 52,540 people with aesthetically inferior water.
   c. Seventy percent (70%) needed additional treatment facilities and eighty-three percent (83%) needed improvement in the operation of present facilities in order to assure safe drinking water at all times.
   d. Ninety-six percent (96%) were not providing adequate disinfection (chlorination). Unsatisfactory disinfection removes the margin of safety against disease transmission by water.
   e. Ninety-six percent (96%) had operators with little or no training in water treatment or systems, which accounts for the poor operation, maintenance and quality-control noted during the study.
3. Of the six public water supplies in Wyoming which were fluoridating:

   a. Only two were maintaining a fluoride concentration within the range recommended by the State. The other four were all underfeeding, significantly reducing the benefits of fluoridation.
   b. Four had inadequate fluoride feed and control equipment.

Semi-Public Water Supplies

1. Very little is known about the number of semi-public supplies in Wyoming or the quality of water they are serving.
2. Of the thirteen semi-public water supplies studied:
   a. Thirty-one percent (31%), serving an estimated 1900 people annually, failed to meet bacteriological standards.
   b. Forty-six percent (46%), serving an estimated 2300 people annually, failed recommended chemical drinking water standards.
   c. Eighty-five percent (85%), serving an estimated 14,000 people annually, were given an overall unsatisfactory rating due to deficiencies. None of the 13 systems disinfected their water supplies.

Individual Water Supplies

1. Of the 127 individual water supplies studied:
   a. Twenty-eight percent (28%), serving 230 people, failed to meet bacteriological quality standards.
   b. Seven percent (7%), serving 60 people, failed mandatory chemical drinking water standards.
   c. Sixty-five percent (65%), serving 530 people, failed recommended chemical drinking water standards.

   d. One hundred percent (100%) had one or more facility deficiencies. Very few were constructed to prevent entrance of contamination.

Surveillance Activities

1. Not all of the public water supplies are listed or under surveillance by the State. Twelve of these supplies were found during the study.
2. Of the 107 public water supplies listed by the State:
   a. Only nine percent (9%) had a formal inspection during 1971.
   b. Twenty-seven percent (27%) have not had an engineering evaluation since 1967.
   c. Thirty-four percent (34%) failed to submit the required number of bacteriological samples for two or more months during 1971.
   d. Fourteen percent (14%) have been rated unsafe by the State for at least three years.
   e. Ninety-six percent (96%) have never had a complete chemical analysis performed on their water. There is no routine chemical sampling program. This is a serious deficiency since certain chemical constituents can cause adverse public health effects.
3. Of the six water supplies which fluoridate:
   a. None submitted routine check samples to the State during 1971.
   b. Only two were inspected during 1971.

4. With the exception of Natrona County, there is no effective surveillance of the estimated 600 semi-public supplies. The actual number of supplies is unknown. Sanitary surveys of the water sources are not being conducted. Very few are submitting routine bacteriological samples and none are submitting samples for chemical analysis.
5. An effective level of surveillance of semi-public and individual supplies was being provided by the local health department (Casper-Natrona County Health Department) studied. Extensive bacteriological testing is being conducted, as well as sanitary surveys of water sources and septic tank installations. As a result, Natrona County had a much lower percentage of contaminated individual supplies than the other two counties surveyed.
6. There are only two local health departments in the State, which limits the overall surveillance and technical assistance programs.

Water Supply Program

Several Wyoming statutes place legal responsibility concerning public and semi-public water supplies in the Department of Health and Social Services. Presently, the Water Supply Program activities are conducted by Sanitary Engineering Services (public water supplies) and Environmental Surveillance and Control Services (semi-public and individual supplies). However, these agencies have many other program responsibilities, including water pollution control, solid wastes, food service establishments, hospitals, nursing homes and schools. The result has been a steady deemphasis on water supply activities. The funds and man-years available for drinking water protection in Wyoming are inadequate to support an effective program. A total of only about $44,000 was spent on drinking water activities during fiscal year 1971. As a comparison, almost twice that amount was expended for water pollution control. The percentage of Sanitary Engineering Services' budget allotted to public water supplies actually decreased from 23% in fiscal year 1971 to 19% in fiscal year 1972.

Staff limitations have prevented the Water Supply Program from fulfilling its responsibilities. Only 1.7 professional man-years are available, which represents a 50% decrease in staff during the last ten years. However, the number of water supplies and responsibilities has continued to increase. As a result, important water supply activities are not being performed, or are being performed only in a cursory manner, seriously reducing the Program's effectiveness.

Stronger State action is needed to correct water supply system deficiencies, especially when systems are rated unsafe year after year. The penalties for violating public health regulations are ill-defined and insufficient in regard to water supplies. The lack of legislation enabling the Department of Health and Social Services to adopt drinking water standards and a plumbing code also hampers surveillance activities.

Wyoming has very few regulations concerning development, construction, acceptable treatment, and operation of water supplies. There are no chemical quality standards for raw or finished drinking water, nor definitions of minimum acceptable treatment for types of water sources. No provisions are made for the orderly development of new public water supplies, nor minimum design or construction requirements. There are construction standards for water wells, issued by the State Engineer's Office, but they are not being enforced. Water well contractors are not required to be licensed. The lack of well-defined regulations and policies has caused problems for Water Supply Program staff as well as water works officials.

Operator training and certification activities have just started, therefore; most operators have little or no training, resulting in many of the operational difficulties noted during the study.

A false sense of security exists concerning the safety of water supplies in Wyoming. The Wyoming Water Supply Program is not meeting its responsibility of protecting the quality of water served to the State's residents and visitors. This situation has resulted from the steady decline in resources allocated to water supply activities. The time has come to reverse this trend.

Waterborne disease outbreaks have occurred in Wyoming, and essentially in all the cases, it was shown that deficiencies existed in the water supply systems during the time when disease was transmitted. Furthermore, these deficiencies either were unrecognized because of inadequate surveillance for public health hazards, or were recognized but not remedied due to ineffective persuasion or enforcement by health officials. Deficiencies similar to those reponsible for the outbreaks are present in the water supplies of Wyoming and were found during this study. The requisites for repetition of the tragic waterborne outbreaks of the past, namely inadequate surveillance of water supplies serving the public, and the presence of diseased individuals, definitely exist in Wyoming. An increase in the occurrence of waterborne disease, obviously would cause needless human suffering and might result in a sharp reduction in the $150 million which tourism brings into Wyoming each year. In other words, Wyoming no longer can afford to overlook the importance of the Water

Supply Program and shirk its responsibilities to protect the public health of its citizens. The recommendations of this report need to be implemented if Wyoming is to assure each resident and visitor an adequate and safe supply of drinking water.

RECOMMENDATIONS

A primary purpose of the evaluation was to propose recommendations needed for Wyoming to have an effective and responsive Water Supply Program. These recommendations are listed below:

1. A Water Supply Branch be formed within Sanitary Engineering Services to be responsible for all public, semi-public and individual water supply activities. The Branch should have a minimum annual budget as follows:
    a. Water supply activities - $105,000
    b. Laboratory services - $ 45,000
    Total - $150,000
2. The Water Supply Branch be staffed initially with six professionals and three secretaries.
3. The water supply activities be decentralized by assigning one man-year each to district offices in Rock Springs, Worland, Gillette and Torrington.
4. Adequate space and equipment be provided for suitable bacteriological and chemical laboratory facilities in order to conduct routine drinking water analyses. An additional bacteriologist, two chemists, and a secretary should be hired specifically for this purpose.
5. Legislation be enacted concerning the following items:
    a. To change the definition of a public water supply to include all water supplies which serve the public.
    b. Delegating authority to the Department of Health and Social Services to adopt drinking water standards.

c. Delegating authority to the Department of Health and Social Services to specify required minimum forms of treatment for water sources.

d. Phasing the voluntary certification program into mandatory certification of waterworks and wastewater operators.

e. Mandatory fluoridation of community water supplies serving more than 500 people.

f. Adoption of a State Plumbing Code with specific provisions prohibiting cross-connections.

g. Mandatory certification of water well contractors.

h. Adoption of procedures for the orderly development of new public water supplies.

6. The Water Supply Regulations be revised and expanded to reflect current water supply practice. The following specific items should be included:

   a. Adoption of the 1962 U. S. Public Health Service Drinking Water Standards or their latest revision.

   b. Mandatory disinfection of all water systems serving the public.

   c. The proper development and planning of new water supplies, including minimum design criteria.

   d. Require that plans and specifications be prepared by a professional engineer registered in Wyoming.

   e. Require all supplies which serve the public to submit routine samples for bacteriological and chemical analyses.

   f. Require an engineering inspection in addition to bacteriological and chemical analyses before any system which will serve the public is allowed to go into service.

   g. All communities which fluoridate be required to submit routine check samples for analysis.
   h. Require that a legally constituted group be designated in charge of each public water supply.
   i. Require each public water supply to submit operating reports on a periodic basis.

7. The Water Supply Program increase and improve its surveillance of public and semi-public water supplies to at least the minimum levels outlined in the Drinking Water Standards and the Manual for Evaluating Public Water Supplies. These activities should include, but not necessarily be limited to:
   a. Thorough periodic sanitary surveys of each system, setting priorities and time schedules for those systems having deficiencies. Normally, all supplies should have a formal inspection, including a report, annually. Supplies which fluoridate should be surveyed at least twice a year.
   b. Bacteriological surveillance sufficient to meet the 1962 U. S. Public Health Service Drinking Water Standards.
   c. Routine complete chemical analyses of all supplies.
8. Cooperative compliance with the Regulations of the Water Supply Program continue to be emphasized. However, if cooperation and persuasion fail to achieve prompt compliance, strong enforcement measures should be taken to protect drinking water and public health.
9. The State actively promote and assist in the establishment of local health departments.

10. Provisions be made for close coordination between the Water Supply Program and other governmental functions which affect water supplies, including:

    a. State Engineer's office,

    b. Farmers Home Administration,

    c. Local health departments.

    Regulations of other state agencies should reflect that principal authority for regulation of water supplies rests with the Water Supply Program.

EVALUATION
OF THE
WYOMING WATER SUPPLY PROGRAM

INTRODUCTION

Americans are served the finest and safest drinking water in the world. Since water was first implicated in the transmission of infectious diseases, more than 100 years ago, water treatment methods and technology have improved steadily. The dreaded water-borne epidemics, which one scourged vast areas, are no longer a concern in the United States, testifying to the efficiency of modern water treatment. As a result, a certain complacency has developed among our citizens concerning drinking water. The Community Water Supply Study[1] indicated that this complacency also has spread to the water utilities and regulatory agencies. The states are much less active in the regulation and surveillance of public water supplies. Public and legislative emphasis is being placed now on water and air pollution. In order to meet the outcry and spate of new pollution controls and implementation plans, the states have had to commit more and more of their resources to these new environmental concerns. Therefore, less time and money is being devoted to the drinking water programs. Contrary to popular belief, extensive water pollution control programs do not assure the public will receive safe and reliable drinking water. Such assurance can be gained only from a renewed awareness of the public health importance of drinking water and the establishment of active water supply programs at the state level.

Recognizing these considerations, Mr. Arthur E. Williamson, P. E., Director of Sanitary Engineering Services for the Wyoming Department of Health and Social Services, requested (Appendix A) the Water Supply Branch of the Environmental Protection Agency to evaluate, the Wyoming Water Supply Program.

The purpose of the evaluation was to determine the effectiveness of the Wyoming Water Supply Program as well as to recommend any improvements that may be needed to assure the Wyoming residents safe and wholesome drinking water.

PLAN OF STUDY

Water Supplies in Wyoming

Wyoming is rich in history, scenery, and wide open spaces. The population of 332,416 is spread over 97,914 square miles. About 74% of these people are served by the 107 public water supplies listed by the State. There are an unknown number of small public supplies, which presently are not listed or under surveillance by the State.

Table 1 presents a summary of information concerning the public water supplies in Wyoming. A complete listing with information concerning each supply is included in Appendix B. Since there are only 88 incorporated municipalities in Wyoming, and not all of these have water systems, the listing contains water districts, private water companies, and industrial water systems (such as oil and mining camps). Figure 1 indicates the percentage of supplies serving various population ranges. Over 70% serve less than 1,000 people, which is significant since the Community Water Supply Study[1] showed that it is these small systems which have the most difficulty providing safe drinking water consistently to their consumers. There are an estimated 31,000 private (individual) and 600 semi-public water supplies serving 26% of the total population. The bacterial and chemical quality of these supplies is, for the most part, unknown. The semi-public supplies are of particular concern since they include trailer parks, campgrounds, restaurants and similar establishments which serve the large number of travelers in Wyoming.

Figure 1

Population Ranges Served By Public Water Supplies

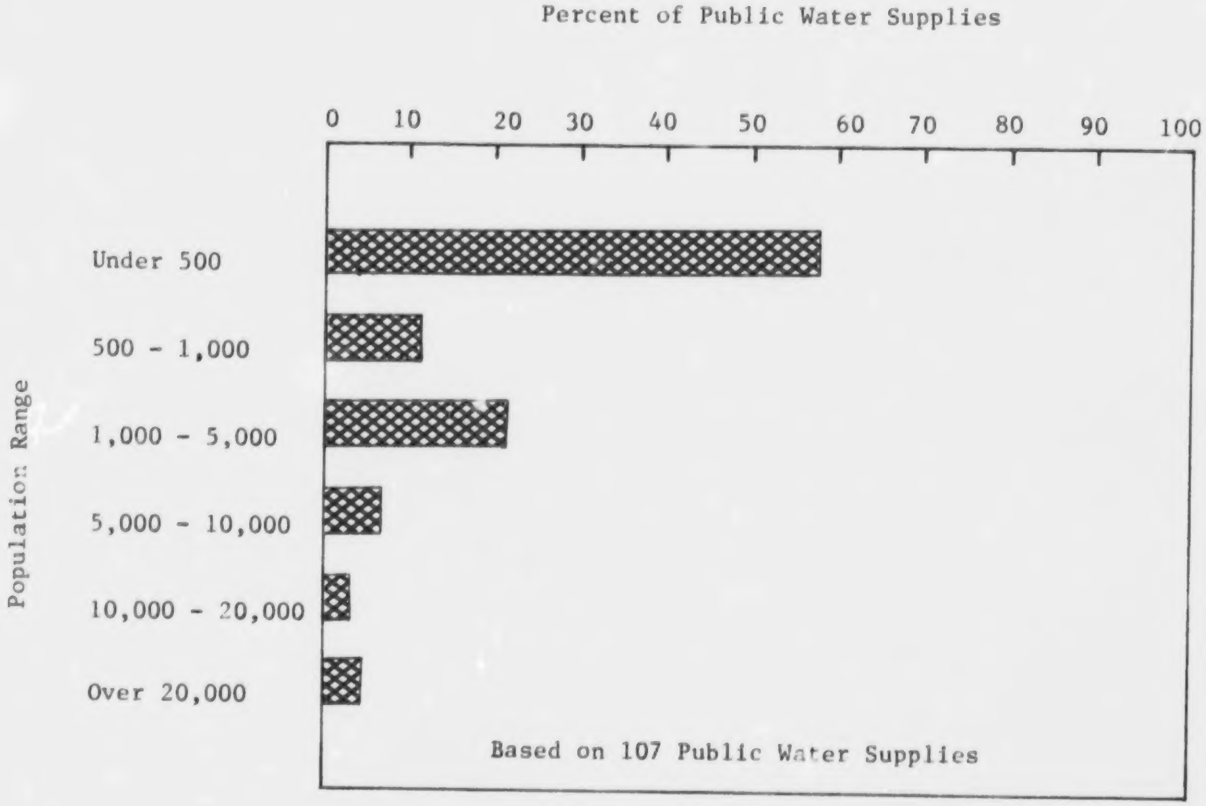


Table 1

Summary - Public Water Supplies In Wyoming

Source of Supply	Number	% of Total	Population Served	% of Pop. Served by PWS2/	Number of PWS Disinfected	% of PWS Disinfected	% of Population Using PWS Served Disinfected Water
Surface	26	24	53,000	21	23	88	98
Ground	73	68	102,500	42	32	44	68
Dual1/	8	8	90,400	37	8	100	100
TOTAL	107	100	245,900	100	63	59	86

1/ Both surface and ground sources

2/ PWS - Public Water Supplies

Purpose of Evaluation

1. To determine the general condition of Wyoming's public, private, and semi-public water supplies by on-site evaluation, bacteriological and chemical analyses and examination of existing records.

2. To evaluate the adequacy of the Water Supply Program based on existing legislation, regulations, manpower, budget, policies, surveillance, laboratory resources, operator training, and the condition of the water supplies.

3. To make any necessary recommendations needed for Wyoming to have and maintain an effective Water Supply Program in order to assure the State's citizens and visitors safe drinking water.

Water Supplies Studied

After discussions with Mr. Arthur E. Williamson, P. E., Director of Sanitary Engineering Services, three of Wyoming's twenty-three counties were selected for in-depth studies of the public, private, and semi-public water supplies. The three counties - Campbell, Lincoln, and Natrona - were selected to reflect differences in type of water supply and surveillance being used. Table 2 gives a breakdown of the supplies studied in each county.

Twenty-three public supplies were surveyed. These systems served about 57,000 people, representing twenty percent of the State's population, using public water supplies. Detailed information concerning these supplies is given in Appendix C. The population ranges served by these supplies is very similar to the statewide distribution shown by Figure 1.

Table 2

Water Supplies Studied

Type of Supply	Number of Supplies				Population Served
	Campbell County	Lincoln County	Natrona County	Total	
Public					
a. Municipalities	1	4	3	8	53,815
b. Other	2	12 (Pipeline Companies)	1	15	3,190
Semi-Public	4	6	3	13	18,900*
Private	32	42	53	127	820

* Estimated population served annually

Ninety-one percent of the public supplies studied used ground water sources and twenty-six percent, serving 52,505 people, were disinfected. In addition, thirteen semi-public supplies, serving an estimated 18,900 people annually, and 127 private supplies, serving 820 people, were surveyed. Overall, it was felt that these were a representative cross-section of Wyoming's water supplies and would provide a good indication of the effectiveness of the Water Supply Program.

Campbell County

Campbell County is located in northeastern Wyoming and has a total population of 13,000. Approximately ninety percent of these people live in or adjacent to Gillette, which is the only municipality in the county. Major oil, natural gas, and coal deposits located in the county have made Gillette a "boom town". Gillette's population almost has tripled in the last ten years, resulting in a great deal of unplanned growth. The entire county depends on ground water as a water supply source. There are between 450 and 500 private wells, most of which are between 200 to 900 feet deep. There is no County health authority, but the State Health Department has a district office located in Gillette, staffed with a sanitarian and sanitarian aide, providing services to a five-county area.

Lincoln County

Lincoln County, in western Wyoming adjacent to the Idaho border, has a population of 8,640. The two major communities are Kemmerer and Afton which account for about fifty percent of the county's population. A very picturesque area, known as Star Valley, lies in the northern portion of the county. This area is characterized by small agricultural communities and is quite famous for its dairy products. Large numbers of tourists visit the Star Valley each year because of the recreational opportunities in the nearby national forests and its proximity to the Grand Teton and Yellowstone National Parks. This area depends almost entirely on alpine springs for water supplies and abounds with small pipeline companies. The State Health Department estimated that there may be 80 of these companies formed by groups of farmers to tap the springs and pipe the water to their respective communities. Before the study, very little was known about the companies even though some of them had been financed through the Farmers Home Administration. Twelve pipeline companies, serving an estimated 1400 people, were surveyed during the study.

A development company is planning to construct about 1500 summer homes in the Star Valley area. Although the water supply is to be a central system, the sewage disposal method is going to be at the discretion of the individual home owner, which more than likely will result in a septic tank system for each home. This situation could drastically affect the quality of the shallow wells and springs on which the area depends for water supplies and it could pose some very definite public health hazards. The southern portion of the county uses springs and wells for water supplies, except for Kemmerer, which uses a surface source.

Lincoln County does not have a local health authority. An engineer or sanitarian from the State Health Department visits the area occasionally but the water supplies generally receive little surveillance.

Natrona County

Natrona County, situated in the center of the State, has a total population of 51,264. Over 90% of the population is centered in and around

Casper, which is the only major community. The majority of water supplies in the county are shallow wells from 10 to 50 feet deep. The county is unique for Wyoming in that it has a local health department (Casper-Natrona County Health Department) with two sanitarians and a sanitarian aide on the staff. They perform routine surveillance of private as well as semi-public water supplies and enforce a permit system which requires approval of all septic tank installations. This is significant in view of the shallow nature of the ground water and the large number of septic tanks which are being installed in new developments near Casper.

Other

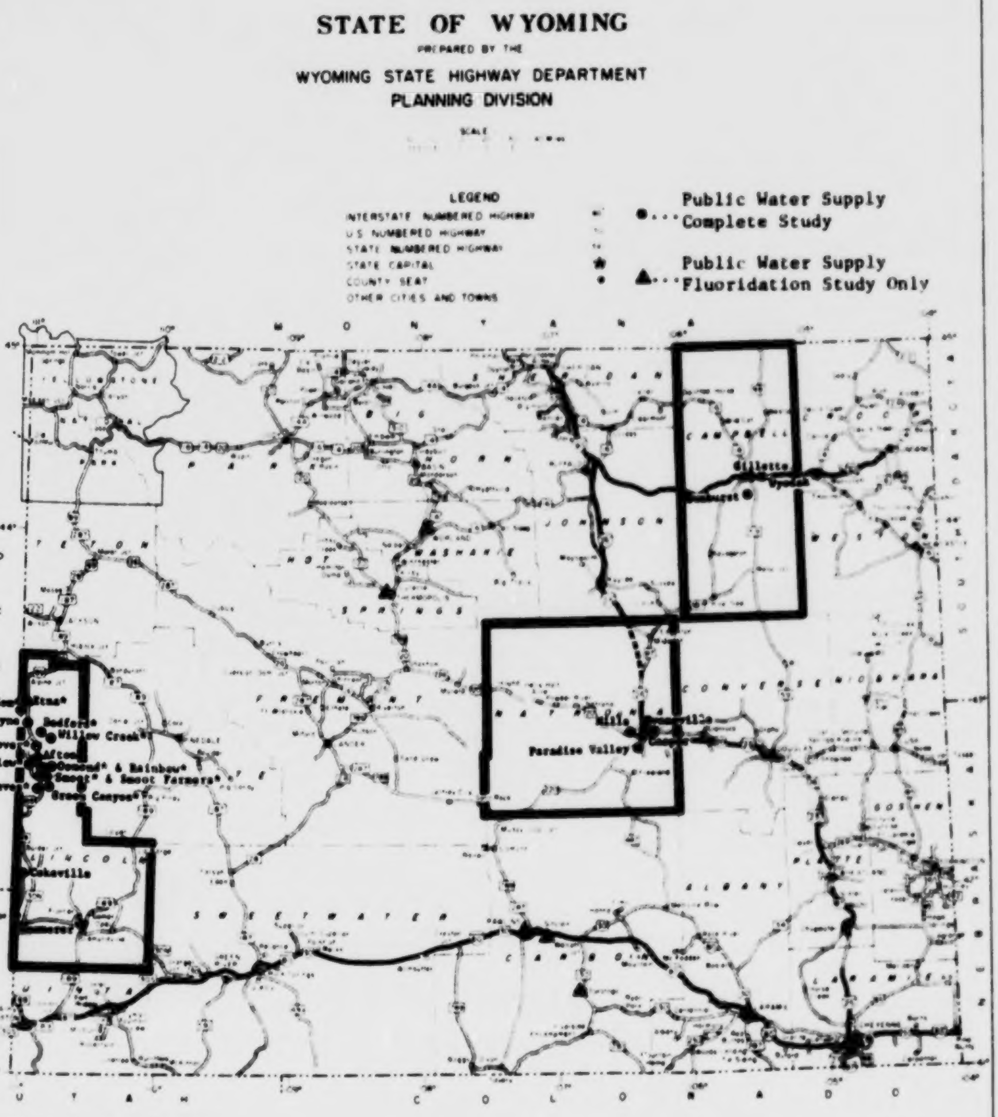
The areas and communities involved in the study are shown in Figure 2. In addition to the public supplies in the three counties, the communities of Laramie, Saratoga, Sinclair, Rawlins, Thermopolis, and Worland which add fluoride to their water supplies were surveyed to determine the adequacy of the fluoridation program.

Evaluation of Bacteriological Water Quality

Bacteriological records for the 107 public water supplies which routinely submit samples to the State Health Department Laboratory, were examined. A supply was given an unsatisfactory rating if it did not meet, for one or more months, the bacteriological requirements of the 1962 United States Public Health Service Drinking Water Standards,[2] hereinafter referred to as the Drinking Water Standards. These limits are summarized in Appendix D.

Figure 2

Water Supplies Studied


STATE OF WYOMING
PREPARED BY THE
WYOMING STATE HIGHWAY DEPARTMENT
PLANNING DIVISION
SCALE
LEGEND
INTERSTATE NUMBERED HIGHWAY
U.S. NUMBERED HIGHWAY
STATE NUMBERED HIGHWAY
STATE CAPITAL
COUNTY SEAT
OTHER CITIES AND TOWNS
● Public Water Supply Complete Study
▲ Public Water Supply Fluoridation Study Only
MONTANA
UTAH
COLORADO
Freedom
Etna*
Thayne
Bedford
Willow Creek*
Grover
Afton
Fairview
Osmond* & Rainbow*
Smoot* & Smoot Farmers*
Reeves
Green Canyon*
Cokeville
Paradise Valley
Mills
Gillette

* Pipeline Companies

A bacteriological sample was taken from each private and semi-public supply and tested in the field, using a membrane filter field kit.[1/] This procedure was used because of the large number of samples being taken and the difficulties involved with mailing them to the State laboratory in Cheyenne. Field testing also was done for those public water supplies studied (11) which were not submitting routine samples to the State. The bacteriological limits of the Drinking Water Standards were used to rate these supplies.

Evaluation of Chemical Water Quality

The available chemical records for the public water supplies were reviewed. In addition, the chemical tests listed in Table 3 were conducted on water samples taken from all the supplies surveyed.

The chemical analysis for each supply was compared with the Drinking Water Standards (see Appendix D) and rated as either:

1. meeting the Standards for all limits,
2. failing to meet one or more of the "recommended" limits (some of which are aesthetic) but meeting all of the "mandatory" limits.
3. failing to meet one or more "mandatory" limits.

Facilities Evaluation

A facilities' evaluation was conducted of each public water supply studied. The adequacy of the sources, treatment, operation, distribution, storage, record keeping, and quality control was judged on the basis of the Manual For Evaluating Public Water Supplies[3] and the Drinking Water Standards. A copy of the survey form used is included in Appendix E.

[1/] Millipore Portable Water Laboratory, Millipore Corp., Bedford, Massachusetts

Table 3

Chemical Tests Conducted During Study

Public Water Supplies

Alkyl Benzene Sulfonate (ABS)
Arsenic (As)
Barium (Ba)
Boron (B)
Cadmium (Cd)
Chloride (Cl)
Chromium (Hexavalent - Cr^{+6})
Cobalt (Co)
Color
Copper (Cu)
Fluoride (F)
Iron (Fe)
Lead (Pb)
Manganese (Mn)
Mercury (Hg)
Nickel (Ni)
Nitrate (NO_3)
pH
Total Dissolved Solids (TDS)
Turbidity
Selenium (Se)
Silver (Ag)
Specific Conductance
Sulfate (SO_4)
Zinc (Zn)

All of the above conducted by the Water Supply Programs Division's Laboratories at Cincinnati, Ohio and Narragansett, Rhode Island

Semi-Public and Private Water Supplies

Barium (Ba)
Cadmium (Cd)
Chromium (Hexavalant - $Cr+^{6}$)
Cobalt (Co)
Copper (Cu)
Fluoride (F)
Iron (Fe)
Lead (Pb)
Manganese (Mn)
Mercury (Hg)
Nickel (Ni)
Silver (Ag)
Specific Conductance*
Zinc (Zn)

Conducted by Water Supply Programs Division's Laboratories at Cincinnati, Ohio and Narragansett, Rhode Island

* TDS concentrations were estimated from specific conductance values

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pH
Sulfate (SO_4)
Temperature

Conducted in field using Hach Direct Reading Engineers' Laboratory, Hach Chemical Co., Ames, Iowa

The source of each supply was evaluated as to its quantity, chemical quality and whether it was being properly protected.

The treatment being provided was judged on the adequacy of the facilities, including standby equipment, as well as their operation and maintenance.

The distribution system was rated on the basis of the available storage, system pressure, and chlorine residual. Finished water storage was judged adequate if elevated or non-pumped storage equaled or exceeded the average daily demand. A system pressure of at least twenty pounds per square inch was considered adequate for purposes of the study. The chlorine residual was considered satisfactory when a detectable residual was maintained in all parts of the distribution system. This determination was based on records maintained by the operator and field tests conducted during the study using the orthotolidine method.

Quality control was evaluated by reviewing the records maintained by the operator and the bacteriological quality of the supply.

The systems were rated in each of the ten categories shown in Table 5. A risk factor, ranging from 0 to 10, reflecting the number of facility deficiencies found, then was assigned to each system. Zero deficiencies (risk factor = 0) indicates least or little risk, while ten deficiencies (risk factor = 10) indicates most or high risk.

The semi-public and individual supplies were rated on the basis of the sanitary surveys conducted during the field visits using the Manual of Individual Water Supply Systems[4] and the Wyoming State Engineer's Minimum Well Construction Standards[5] as guides. The survey form used is included in Appendix E.

Water Supply Program Evaluation

The Water Supply Program was evaluated on each of the following:

1. Surveillance of Public Water Supplies - Bacteriological surveillance was considered adequate if,

   a. the number of samples examined per month for each supply during 1971 met the minimum number specified by the Drinking Water Standards.

   b. the results were reviewed and the necessary follow-up performed routinely.

For the purposes of this study, chemical surveillance was considered satisfactory if a chemical analysis, including all constituents listed in the Drinking Water Standards, had been performed on surface water supplies within the previous year and on groundwater supplies within the previous three years. The adequacy of facilities surveillance was based on the number of supplies which had been visited by an engineer from Sanitary Engineering Services during the previous year. One formal inspection for each supply, including a prepared report, was used as the minimum requirement for this study.

2. Surveillance of semi-public and private water supplies - This evaluation was based primarily on the conditions encountered during the field surveys. The adequacy and responsiveness of the Program to the problems found was the major area of consideration.

3. Legislative authority - The existing legislative authority of the Program was reviewed to determine if it has sufficient policy and regulation-setting power in order to conduct properly its activities and protect the public health.

4. Regulations and policy - The Program's existing regulations and policy were reviewed to determine if they were adequate and reflected current water supply practices.

5. Laboratory support - A survey of the bacteriological and chemical laboratories was conducted to determine the capability of each laboratory to provide adequate support to the Program. Their procedures were evaluated also for compliance with the *Standard Methods for the Examination of Water and Wastewater*,[6] (hereinafter referred to as *Standard Methods*).

6. Budget and staffing - Based on the findings in the above categories, budget and manpower requirements were calculated and compared with those of the current Program.

7. Other factors such as the level and adequacy of operator training and certification, amount of emphasis being placed on fluoridation and cross-connection control programs, coordination with and technical assistance given to other agencies concerned with water supply, and the status of water supplies on the national parks were evaluated during the study.

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STUDY FINDINGS

Public Water Supplies

Bacteriological Quality

A review of the State Health Department records (see Appendix B) revealed that 35 (33%) of the 107 public water supplies failed to meet the bacteriological quality limits of the Drinking Water Standards for one or more months during 1971. These systems were serving approximately 32,500 people (almost ten percent of the State's population) with potentially contaminated water containing disease-producing organisms. Significantly, 17 of these systems were not providing any form of disinfection.

Intensifying the problem is the fact that many supplies either are not submitting the proper number of bacteriological samples each month for testing or are not submitting any samples at all. For example during 1971, 34% of the 107 public water supplies did not submit the required number of samples for two or more months. In addition, 11 of the 23 supplies studied were not submitting any routine samples to the State for bacteriological analysis (Appendix C). Six of these supplies, serving 420 people and providing no disinfection, did not meet the bacteriological quality limits of the Drinking Water Standards based on field testing.

Chemical Quality

The only comprehensive chemical data available for public water supplies was from testing in 1962. The only constituents reported were total dissolved solids (TDS), total hardness, alkalinity, sulfates, iron and fluorides. Of the 76 supplies tested, 45% exceeded the recommended limits of the Drinking Water Standards for TDS and sulfates. Such a partial analysis does not provide any information as to the concentrations of trace elements which can cause adverse health effects.

The chemical tests shown in Table 3 were made for the 23 public supplies studied. Table 4 indicates those supplies which failed to meet the chemical limits of the Drinking Water Standards. Eight of these supplies (35%) did not meet recommended and two supplies (9%) did not meet mandatory limits. The possible effects of these chemical constituents are:

Recommended Limits - When these limits are not met, more suitable sources of water supply should be considered.

1. Total Dissolved Solids and Sulfates - Taste and laxative effect. The laxative effect is more pronounced in newcomers because one becomes acclimated to such waters in a relatively short time.
2. Iron and manganese - Imparts stains to laundered goods and plumbing fixtures. Impairs the taste of beverages, including tea and coffee.
3. Arsenic - Toxic to man and can accumulate in the body. Alternate source of supply should be considered. Under no circumstances should the mandatory limit be exceeded.

Mandatory Limits - When these limits are not met, the water supply should be rejected.

1. Selenium - Can cause disturbances in human physiologic functions at very low levels.

These results point out the importance of doing more complete analyses of water supplies in order to detect any potential health problems.

Table 4

Chemical Standards Not Met By Public Water Supplies

PUBLIC WATER SUPPLY	RECOMMENDED			MANDATORY		
	Constituent	Concentration, mg/1 [a]	DWS,[b] mg/1	Constituent	Concenration, mg/1	DWS,[b] mg/1
CAMPBELL COUNTY:						
Gillette	TDS [c]	1800	500			
	Sulfate	915	250			
	Manganese	0.14	0.05			
Sunburst Utility	TDS	700	500			
	Iron	1.2	0.3			
Wyodak	Iron	0.4	0.3			
LINCOLN COUNTY:						
Fairview Pipeline	Iron	0.4	0.3			
Kemmerer	Manganese	0.12	0.05			
CAMPBELL COUNTY:						
Casper	Arsenic	0.02	0.01			0.05
Mills	TDS	1000	500	Selenium	0.03	0.01
	Manganese	0.12	0.05			
	Sulfate	525	250			
Paradise Valley North Well [d]	TDS	2230	500	Selenium	0.13	0.01
	Sulfate	1270	250			
West Well	TDS	1270	500	Selenium	0.02	0.01
	Sulfate	520	250			
Total Population Affected:		52,540		3,230		

[a] - Milligrams per liter

[b] - Drinking Water Standards

[c] - Total Dissolved Solids

[d] - This well taken out of service on recommendations of State Health Department and Casper-Natrona County Health Department

Facilities Appraisal

A summary of the facilities appraisal information from the field surveys is presented in Table 5. Each system was rated in ten different categories. The "risk factor" is the sum of the deficiencies for each system (that is, a "risk factor" of 5 indicates 5 deficiencies). The factors ranged from 2 to 9 with an average of 5.8 showing that problems exist, especially with the smaller supplies which had the highest "risk factors". For example, the communities serving a population less than 1,000 had an average "risk factor" of 6.4, while those serving more than 1,000 people averaged 4.5. Casper, the largest community studied, had a risk factor of 2. Although serving only a small percentage of the public, these results indicate that the small systems pose the greatest public health risk which becomes more significant considering the large tourist use of these systems.

The 12 pipeline companies had an average "risk factor" of 6.5, whereas the other 11 systems had an average of 5.1. Probably this was due to the fact that the pipeline companies were receiving no surveillance from the State Health Department, therefore they had more deficiencies. However, the difference was not that significant, indicating that more effective surveillance and enforcement is needed for all public water supplies to insure the protection of public health. This was shown further by a review of State Health Department records which revealed that the vast majority of Wyoming's public water supplies would have a "risk factor" of between 5 and 6.

The major deficiency found was the systems were either not providing disinfection (chlorination), or not disinfecting to the extent that a detec-

Table 5

Public Water Supplies Facilities Appraisal

Public Water Supply	Source			Treatment		Distribution			Quality Control		Risk Factor
	Quality	Quantity	Protection	Facilities	O&M	Storage	Pressure	Disinfection	Records	Bact. Quality	
Campbell County											
1. Gillette	X			X	X			X**	X		5
2. Sunburst Utility	X	X	X	X	X	X	X	X-N	X		9
3. Wyodak				X				X-N			2
Lincoln County											
4. Afton			X	X	X			X-N		X	5
5. Bedford*			X	X	X	X		X-N	X	X	7
6. Cokeville		X	X	X	X			X**	X		6
7. Etna*			X	X	X			X-N	X	X	5
8. Fairview*		X	X	X	X			X-N	X		7
9. Freedom*			X	X	X	X	X	X-N	X		8
10. Green Canyon*			X	X	X			X**	X	X	6
11. Grover*		X	X	X	X	X		X-N	X	X	7
12. Kemmerer		X		X	X	X		X**	X		6
13. Osmond*			X	X	X			X-N	X		4
14. Rainbow*		X	X	X	X			X-N	X		6
15. Reeves*		X	X	X	X	X		X-N	X	X	8
16. Smoot*		X	X	X	X	X		X-N	X	X	8
17. Smoot Farmers*			X	X	X			X-N	X		5
18. Thayne		X	X	X	X	X		X-N		X	7
19. Willow Creek*			X	X	X	X	X	X-N	X	X	7
Natrona County											
20. Casper		X						X**			2
21. Evansville		X		X	X			X-N	X	X	6
22. Mills	X			X		X		X**	X		5
23. Paradise Valley	X	X							X		3
No. "X" s	4	12	16	21	19	10	3	22	19	10	Ave. = 5.8
%	17%	52%	70%	91%	83%	44%	13%	96%	83%	44%	

X = Deficiency

O&M = Operation & Maintenance

X-N = Do not provide disinfection

X** = Provide disinfection but do not maintain a chlorine residual throughout the distribution system

Risk Factor = Number of deficiencies

* = Pipeline companies

table chlorine residual was present throughout the system. Such a residual is necessary to provide a margin of safety in the event contamination enters the distribution system after the water has been treated.

Seventy percent of the systems studied were not providing proper protection for their water sources, which further illustrates the need for better disinfection procedures. Poor source protection and disinfection practices are reflected also by the fact that 44% of the 23 systems failed to meet the bacteriological quality standards.

Eighty-three percent of the systems needed improvements in the operation and maintenance of their facilities and in keeping of quality control records.

Operator Competence

Proper operation and maintenance is essential in order to have a safe and reliable water supply system. Unfortunately, most people (including city officials) think that all an operator has to learn is how to start the pump and repair leaky pipes. However, a good operator should have a much broader background, including knowledge of disinfection (and its importance), as well as elementary water chemistry and microbiology.

Of the 23 public supplies surveyed, only seven had full time operators. The remaining supplies (pipeline companies and other small systems) had no one responsible for the water supply even on a part-time basis. Generally, these systems had the most deficiencies, as noted in the previous section. This is a universal problem with small supplies since they cannot afford to hire a full or even part-time water system operator. Generally, the mayor, town clerk, or policeman looks after the system, resulting in a very low level of maintenance and quality control. This same situation occurs when a small town has one man in charge of the streets, sewage disposal, water supply and garbage disposal.

All of the operators interviewed were conscientious and interested in doing the best job possible. However, only one of them had any formal training concerning the operation and maintenance of a water supply system or a cursory knowledge of basic water chemistry or microbiology. All but three of the operators regarded disinfection as an unnecessary nuisance, and only four maintained any form of records. All this points to an obvious need for training. At the time of this survey, the State was initiating a training program which is discussed in more detail later.

Fluoridation

Many years of medical and dental research have shown fluoridation to be a safe and beneficial practice. The proper addition of fluorides to a water supply can reduce the incidence of tooth decay in children by as much as 65%. In order for the maximum benefits to be realized, the fluoridation equipment must be well operated and maintained.

The six Wyoming communities which fluoridate their water supplies (Laramie, Rawlins, Saratoga, Sinclair, Thermopolis, and Worland) were surveyed to assess their fluoridation practices. These communities serve approximately 43,300 people. The findings are presented in Appendix F and summarized below.

The actual level of fluoride in the distribution system is the single most important factor in evaluating the adequacy of a community water-fluoridation effort as well as the benefits which will be received. Of the six supplies, only two had a fluoride content within the 1.0 - 1.2 milligrams per liter (mg/l) range recommended by the State. The other four installations were underfeeding, thereby significantly reducing the benefits of fluoridation. Only two of the facilities were checking fluoride concentrations in the finished water on a daily basis, and none of them were doing any raw water analysis. One operator did not check the fluoride levels at all, and another was not using testing procedures approved by *Standard Methods*.

Fluoride feed equipment and facilities which control the amount of fluoride added were adequate only at two of the installations surveyed. Feeding arrangements were judged inadequate at three of the plants, and maintenance was unsatisfactory at one plant. Storage arrangements and safety precautions for handling fluoride compounds were inadequate at two of the facilities.

A trained operator with a genuine interest in feeding fluorides is essential to the satisfactory operation of a fluoridation installation. Generally, the plants visited appeared to be under the control of an operator who understood the equipment and how to adjust or control the feeding mechanisms. However two of the operators did not favor feeding fluorides to public water systems. One operator shut down his fluoridation equipment during the summer to save on chemicals.

In summary, fluoridation in Wyoming is unsatisfactory. The communities are not receiving the benefits for which they are paying and which properly managed fluoridation can achieve.

Semi-Public Water Supplies

Wyoming's estimated 600 semi-public water supplies serve a major portion of the more than six million tourists and residents who travel in the State each year. The State Health Department further estimates that seventy new semi-public supplies are being added each year. However, very little is known about the adequacy or quality of these supplies. During the study, 13 semi-public systems, serving about 18,900 people annually were surveyed. The findings are summarized in Table 6.

Bacteriological Quality

Four of the supplies (31%) failed to meet the bacteriological quality limits of the Drinking Water Standards. The State Health Department found that approximately 30% of the 350 semi-public supplies sampled during 1971 also failed the bacteriological standards. These results indicate that a significant percentage of the travelers in Wyoming are being served potentially contaminated water.

Chemical Quality

All of the 13 supplies tested met the mandatory limits of the Drinking Water Standards, but six (46%) of the supplies failed to meet one or more of the recommended standards. As with the public supplies, the standards not met were for total dissolved solids (TDS), sulfates, iron and manganese. Therefore, no public health problems were involved. The high TDS and sulfate levels probably do cause some gastrointestinal discomfort to many of the tourists who are not accustomed to the water.

Facilities Appraisal

The field surveys revealed that the general condition of the semi-public supplies studied was poor. Ten of the supplies had little or no sanitary protection, meaning that contamination could enter at any time. Overall, 11 of the systems, serving an estimated 14,300 people annually,

Table 6

Semi-Public Water Supplies

SUPPLY	POPULATION SERVED	SOURCE			TREATMENT		SURVEILLANCE	QUALITY		RATING
	Estimated Annual Population	Adequate Quantity	Type	Sanitary Protection	Disin-fection	Additional Treatment	Health Agency Visit in Last Two Years	Bacterio-logical Results *	Chemical	
Campbell County:										
Diamond Trailer Court	400	No	Well	Yes	No	No	No	0	R	U
Carson Trailer Court	600	Yes	Well	No	No	No	No	0	R	U
Provost Trailer Court	100	Yes	Well	No	No	No	No	4	R	U
Lakeside Motel & Trailer Court	1600	Yes	Well	Yes	No	No	No	0	OK	S
Lincoln County:										
Reese's Supper Club	1000	Yes	Well	No	No	WS	Yes	0	R	U
K. O. A.	3000	Yes	Well	Yes	No	No	Yes	0	OK	S
Alpine Lodge	3600	No	Well	No	No	No	No	0	OK	U
Silver Stream Lodge	6000	Yes	Well	No	No	No	Yes	0	OK	U
Gardner Campgrounds	600	Yes	Spring	No	No	No	No	4	OK	U
Wa-Hoo Campgrounds	700	No	Wells (2)	No	No	No	No	0	OK	U
Natrona County:										
Boy Scouts	200	No	Well	No	No	No	Yes	4	R	U
Short's Trailer Court	100	Yes	Well	No	No	No	Yes	0	OK	U
Rim Rock Bar	1000	Yes	Cistern	No	No	WS	Yes	4	OK	U

* - Coliform Colonies per 100 milliliters

R - Failing one or more of the recommended standards of the 1962 U.S. Public Health Service Drinking Water Standards (see Appendix D)

U - Unsatisfactory

S - Satisfactory

WS - Water Softener

were given unsatisfactory ratings due to the deficiencies found. This illustrates the need for routine surveillance and bacteriological monitoring of all the semi-public supplies in order to assure safe drinking water for the traveling public.

Private Water Supplies

Approximately 86,000 Wyoming residents depend on private water supplies; but there is little information concerning the condition of these supplies. Evaluations were made of 127 private supplies during the study to determine if problems exist. The detailed results are presented in Appendix G.

Bacteriological Quality

As shown by Figure 3, bacteriological contamination of the private water supplies is a problem in Wyoming. Of the 127 supplies studied, 28% failed the bacteriological limits of the Drinking Water Standards.

It is interesting to note that Natrona County showed a much lower percentage of contamination than the other two counties. Based on the shallow nature of the wells in this county, the percentage should have been as great, if not greater, than the other counties. However, Natrona County has an active local health department which oversees the construction of new wells and septic tanks. The other two counties are served by district sanitarians of the State Health Department; however, they are responsible for ten other counties resulting in a limited effort in any one area.

Chemical Quality

Sixty-five percent of the private supplies tested (see Figure 4), did not meet one or more of the recommended limits set by the Drinking

Figure 3

Bacteriological Quality

of

Private Water Supplies Studied

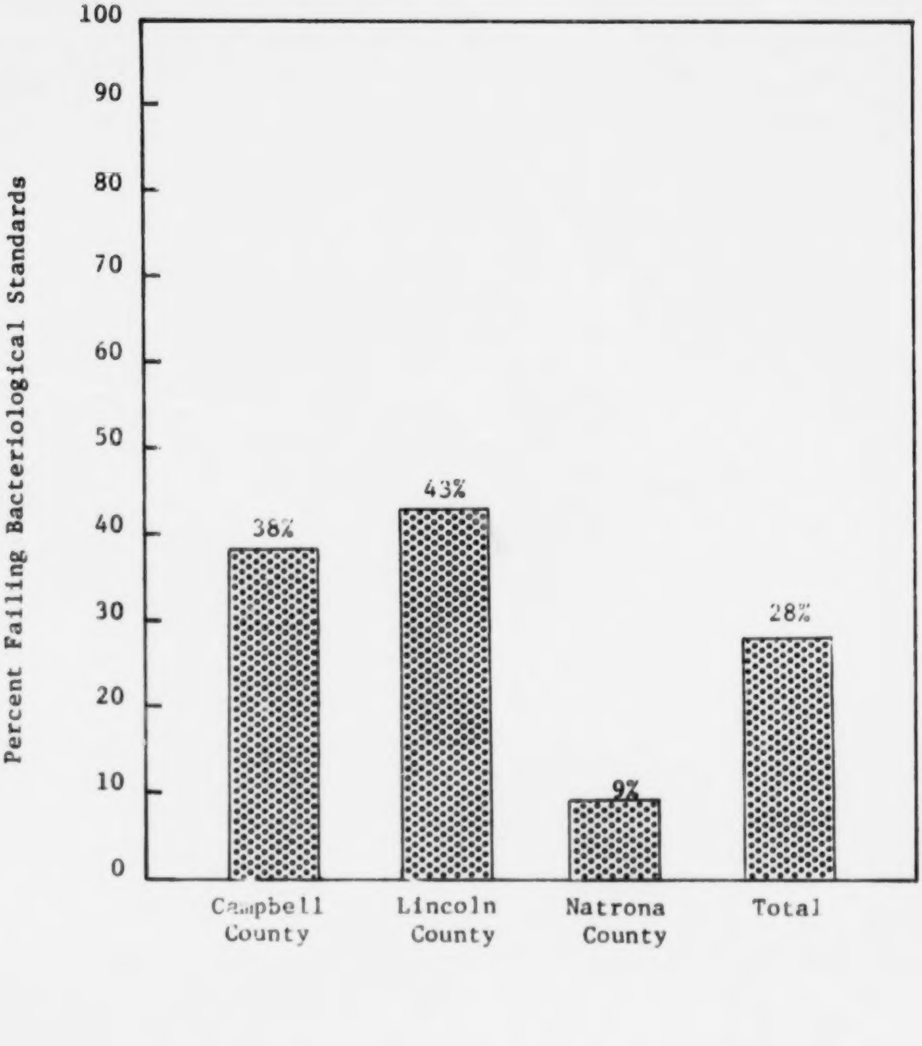
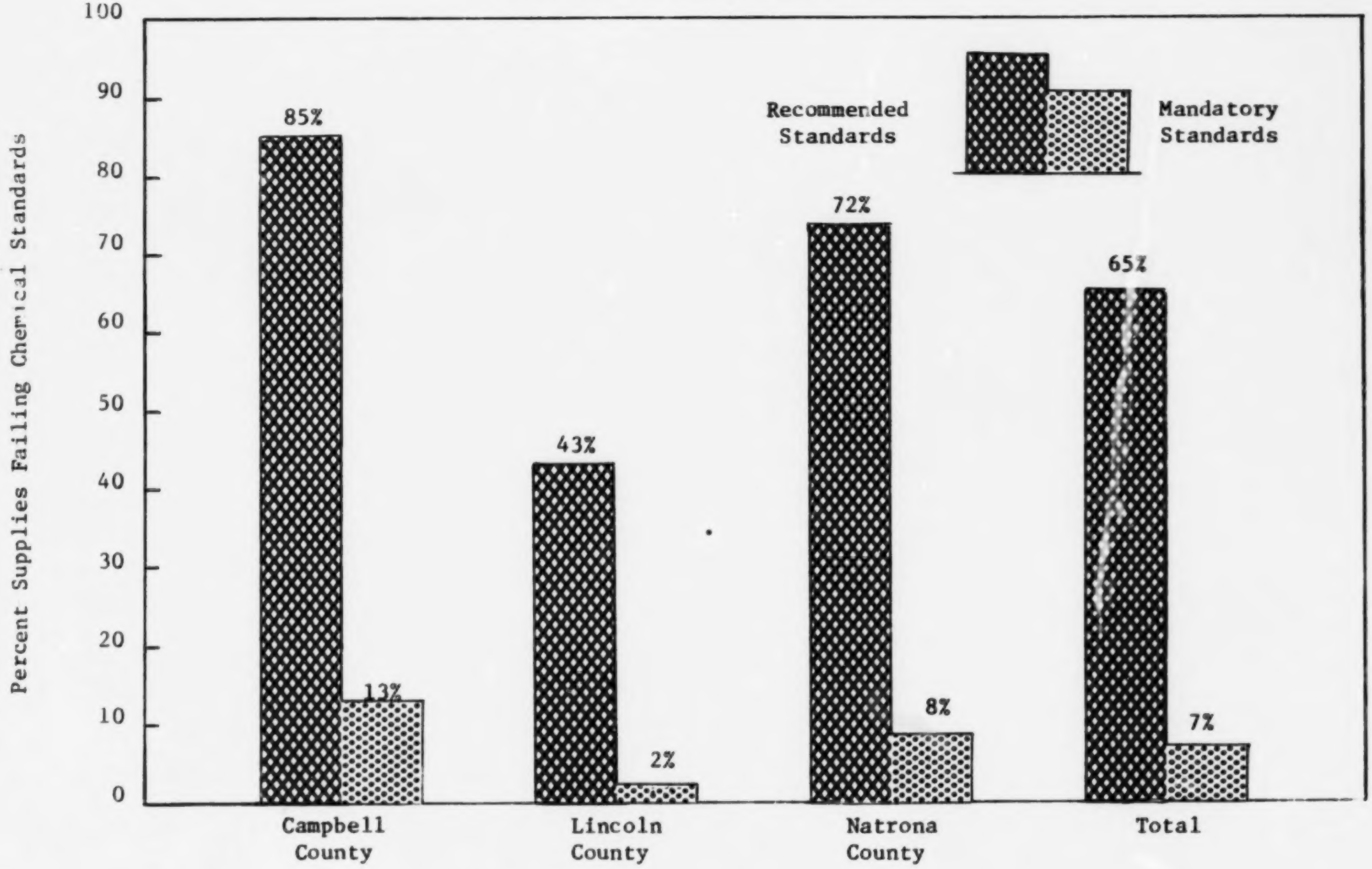


Figure 4

Chemical Quality

of

Private Water Supplies Studied



Water Standards for the constituents tested (see Table 3). As was the case with the public and semi-public supplies, the exceeded standards were for total dissolved solids (TDS), sulfates, iron and manganese.

A total of nine supplies (7%) failed to meet one of the mandatory standards. In seven cases, the standard not met was for fluoride, with concentrations ranging from 2.3 to 6.0 mg/l. The dental health benefit of the optimum fluoride amount has been well documented; however, excessive fluoride can cause mottling of teeth, especially with children.

Facilities Appraisal

The construction and sanitary protection of the private water supplies was inadequate in all three counties. Deficiencies threatening the safety of the source were found in every supply surveyed. None of the 113 wells inspected met Wyoming's Minimum Water Well Construction Standards.

The factors contributing to the high incidence of bacterial contamination were evident. Of the 27 wells which failed the bacteriological limits 26 did not have a formation seal around the casing, and 16 did not have a sanitary well seal or cover on top of the casing. None of the six unsafe spring sources were protected by adequate fencing to exclude livestock and wildlife, or drainage ditches to divert surface runoff. Such protective measures are essential to insure safe and reliable water supplies.

The potential for more widespread contamination is present since none of the supplies surveyed were protected adequately, as indicated by the following results:

1. Of the 113 well supplies surveyed --
    a. 94% lacked cement grout seals of any kind,
    b. 45% did not have sanitary well seals,
    c. 52% had poorly constructed well pits, increasing the possibility of contamination.
2. Of the 12 spring supplies surveyed --
    a. 100% were constructed poorly and developed inadequately,
    b. 75% lacked surface drainage ditches,
    c. 83% were not surrounded by adequate fencing.

Although no evidence of bacterial contamination was found in many of the supplies, it can enter an unprotected source at any time. The results can be tragic. During the last ten years, 73% of recorded waterborne outbreaks in the United States were due to contaminated private water supplies.

A definite need exists for more activity in the private water supply field. The general public knows very little of proper source protection and sanitation. Unfortunately, neither do many water well contractors as evidenced by the poor construction found during the study.

The establishment of more local health departments and some means of enforcing the Minimum Water Well Construction Standards would be major improvements.

Water Supply Program Evaluation

The preceding sections have presented the study findings related to the general condition of water supplies in Wyoming and the problems which were found. In order to determine if the State's Water Supply Program was meeting adequately or was capable of meeting the needs and problems, an indepth evaluation was conducted of the Program.

History of the Water Supply Program

The first water supply activity at the State level started in 1911 by the Board of Health and its various county health officers. During 1917 and 1918, the United States Public Health Service provided a doctor and engineer to work in water supply due to numerous disease outbreaks occurring as a result of troop mobilization and migration of people. However, a specific Division of Sanitary Engineering, comprised of one engineer and a stenographer, was not established until 1936. An inventory of the seventy-two community water supplies was initiated. During these early years, most of the improvements were achieved through the Federal Public Works Administration and Works Progress Administration. A formal public health laboratory was established in 1939 and even though a bacteriological quality testing program was started, it suffered many setbacks. Consequently, data related to the sanitary quality of municipal water supplies are available only from 1950. Presently, all of the State's water supply activities are being performed under the auspices of the Wyoming Department of Health and Social Services.

Legal Authority and Responsibilities

Several Wyoming statutes place legal responsibilities concerning public and semi-public water supplies in the Department of Health and Social Services (hereinafter called the Department).[2/] These laws are compiled in Appendix H and are summarized below:

35-19. Authorizes Department to inspect public water supplies.

35-23. Empowers the Department to make such rules and regulations needed

---

2/ The Department replaced the Board of Health on July 1, 1969 and assumed all of the Board's vested powers, duties and regulatory authority.

to carry out the provisions of the statutes.

35-25. Authorizes Department "to enforce such sanitary standards for the protection of public health as to the quality of water supplied to the public," and to advise as to the best methods for purification of water.

35-184. Assigns the Department the responsibility for general oversight and care of all waters relating to public water supply and pollution control.

35-185. Authorizes examination of waters to determine suitability for domestic use. Also authorizes rules and regulations to secure the sanitary protection of domestic supplies.

35-187. Directs the Department to consult with and advise cities, corporations and persons concerning water supplies and purification. Requires the submission of plans for the construction of all new water systems or extensions to existing systems to the Department for review and approval. Approval is required prior to construction.

35-197 through 200. Requires submission of routine samples to the Department for bacteriological testing. Defines public water supply as having ten or more service connections. Establishes the 1962 U. S. Public Health Service Drinking Water Standards (bacteriological only) as State standards. Requires reporting and notification of unsafe conditions.

Policies

The Department has established the following unwritten policies regarding public water supplies:

1. Chlorination of all public water supplies is recommended regardless of the purity of the source.
2. Simple chlorination is not considered adequate treatment for surface waters derived from uncontrolled watersheds, regardless of the bacteriological quality.

Standards and Regulations

The Department uses the Drinking Water Standards for judging the acceptability of sources for domestic water supplies.

Although no detailed construction standards have been developed, the Department uses the Great Lakes - Upper Mississippi River Board of State Sanitary Engineers Recommended Standards for Waterworks (Ten State Standards)[7] as guidelines. Other standards which have been published by the Department are:

1. Minimum Standards for Private or Semi-Public Water Supplies.
2. General and Special Standards Governing Mobile Home Parks, Travel Trailers, Truck Campers and Tenting Units.
3. Minimum Standards Governing Dude Ranches.
4. Minimum Standards for Private Sewage Disposal Systems.
5. Standards Governing Fluoridation of Water.

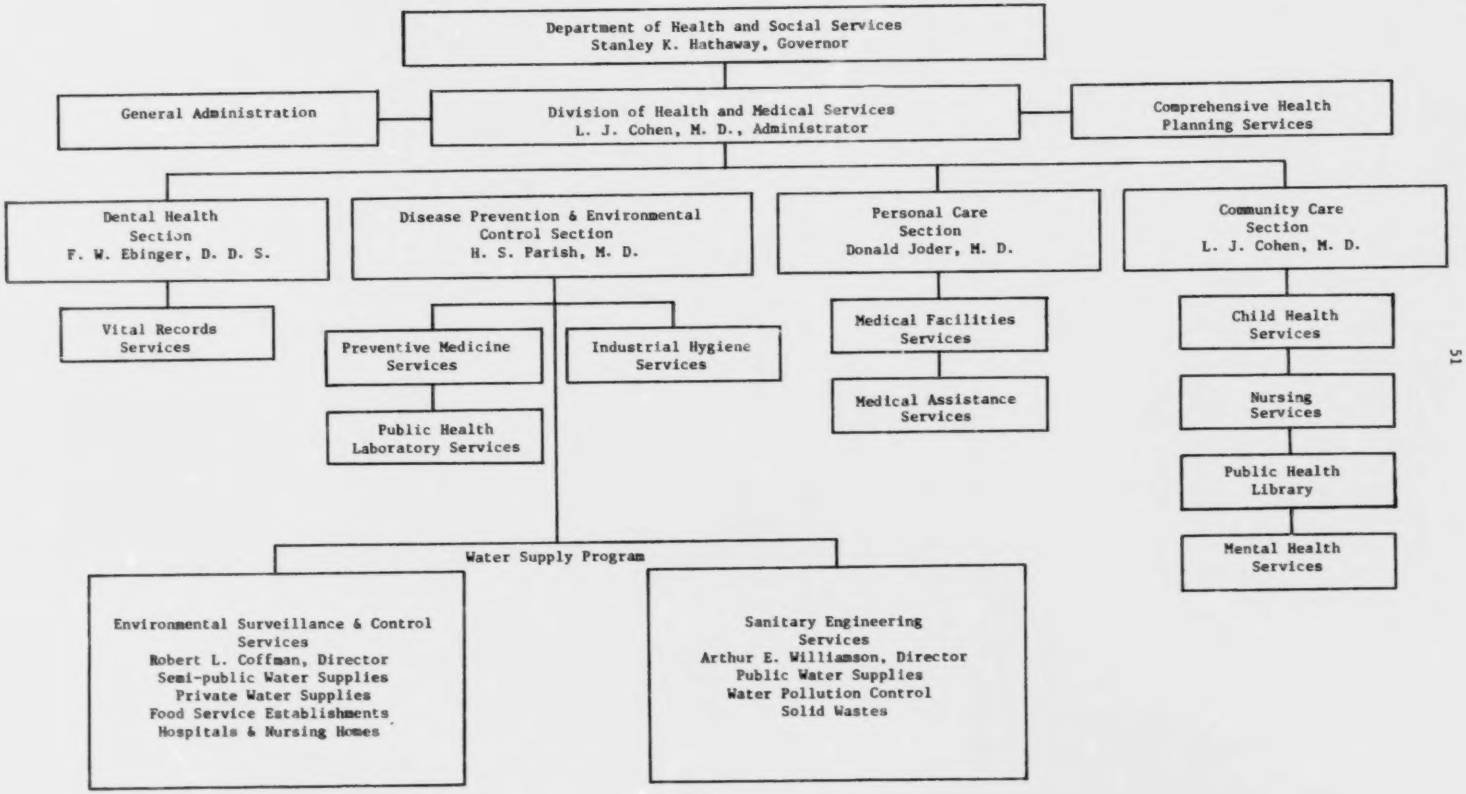
Those sections that deal specifically with water supplies are included in Appendix I.

Organization

The organization chart for the Wyoming Department of Health and Social Services is shown in Figure 5. The responsibility for the Water Supply

Figure 5

Wyoming Department of Health and Social Services


Department of Health and Social Services
Stanley K. Hathaway, Governor
General Administration
Division of Health and Medical Services
L. J. Cohen, M. D., Administrator
Comprehensive Health Planning Services
Dental Health Section
F. W. Ebinger, D. D. S.
Vital Records Services
Disease Prevention & Environmental Control Section
H. S. Parish, M. D.
Preventive Medicine Services
Public Health Laboratory Services
Industrial Hygiene Services
Personal Care Section
Donald Joder, M. D.
Medical Facilities Services
Medical Assistance Services
Community Care Section
L. J. Cohen, M. D.
Child Health Services
Nursing Services
Public Health Library
Mental Health Services
Water Supply Program
Environmental Surveillance & Control Services
Robert L. Coffman, Director
Semi-public Water Supplies
Private Water Supplies
Food Service Establishments
Hospitals & Nursing Homes
Sanitary Engineering Services
Arthur E. Williamson, Director
Public Water Supplies
Water Pollution Control
Solid Wastes

Program lies within two areas under the Disease Prevention and Environmental Control Section. Sanitary Engineering Services is responsible for public water supplies and Environmental Surveillance and Control Services is reponsible for activities related to semi-public and private supplies. The two local health departments (Casper and Laramie Counties) also participate within their areas of jurisdiction.

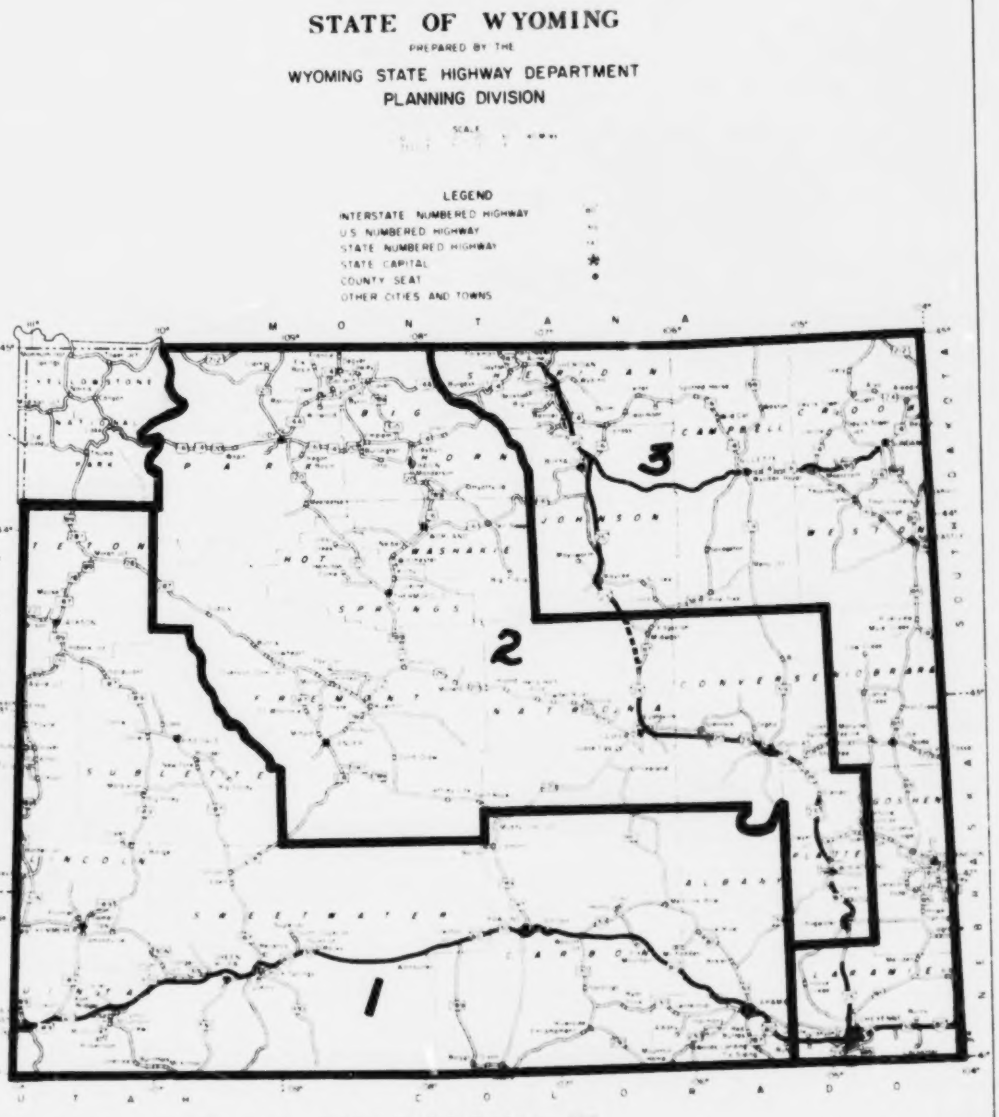
Sanitary Engineering Services

Presently, Sanitary Engineering Services is comprised of a director (sanitary engineer), three public health engineers, a biologist and one and one-half secretarial positions. It is responsible for public water supplies, water pollution control and the solid waste program. The central office from which the entire staff operates, is located in Cheyenne. None of the engineers are assigned specifically to water supply, pollution control or solid wastes. Therefore, stafftime is divided between these activities. The biologist is assigned mainly to solid wastes and river basin planning. Each of the public health engineers is responsible for a district within the State (Figure 6). The districts are quite extensive and require a large amount of travel time. The engineers spend approximately 50% of their time in the field. The professional staff is dedicated and well qualified. Of the four engineers (director plus the three staff engineers), three hold Master of Science degrees and three are registered professional engineers.

Nationally, Wyoming ranks 39 among states in salary paid to the director of a water quality agency ($18,200) and 35 in the top salary paid to staff engineers ($14,500). Figure 7 is a comparison of annual salaries paid to engineers at the starting level and top level (Public Health or Sanitary

Figure 6

Districts of Sanitary Engineering Services

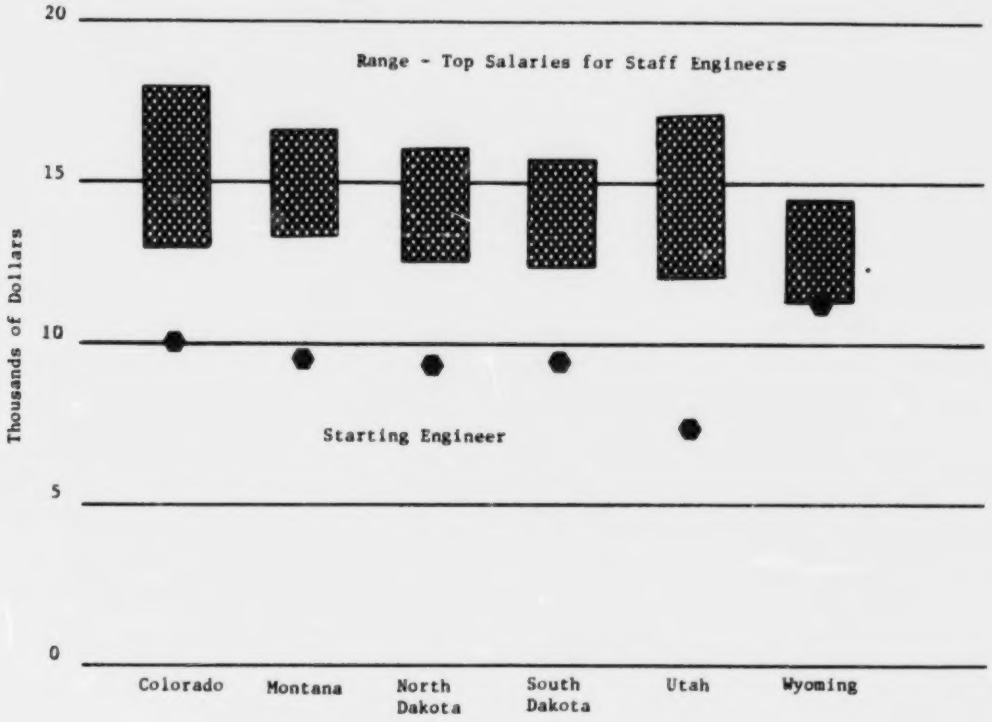

STATE OF WYOMING
PREPARED BY THE
WYOMING STATE HIGHWAY DEPARTMENT
PLANNING DIVISION
SCALE
LEGEND
INTERSTATE NUMBERED HIGHWAY
U.S. NUMBERED HIGHWAY
STATE NUMBERED HIGHWAY
STATE CAPITAL
COUNTY SEAT
OTHER CITIES AND TOWNS
MONTANA
IDAHO
SOUTH DAKOTA
NEBRASKA
UTAH
COLORADO
YELLOWSTONE NATIONAL PARK
PARK
BIG HORN
SHERIDAN
CAMPBELL
CROOK
JOHNSON
WESTON
TETON
HOT SPRINGS
WASHAKIE
CONVERSE
NIOBRARA
FREMONT
NATRONA
SUBLETTE
GOSHEN
LINCOLN
SWEETWATER
ALBANY
CARBON
UINTA
LARAMIE
1
2
3

1. Joseph R. Tynsky, P. E., Public Health Engineer III
2. Robert H. Pinther, Public Health Engineer III
3. Frank R. Harman, P. E., Public Health Engineer III

Figure 7

Annual Salary Comparisons

Fiscal Year 1972



Engineer III). Wyoming's salary range is somewhat less for a staff engineer than the other states in the region. Wyoming's starting salary is high since they require a Master's degree, whereas the other states do not.

Sanitary Engineering Services expended a total of $81,000 during fiscal year 1971 (FY 71) and about $119,000 for fiscal year 1972. A breakdown of the expenditures and man-years of effort by activity is shown in Table 7. Obviously, public water supply is a low priority item due to inadequate staffing and budget. Increased activity in water pollution and solid waste control is resulting in even less emphasis on the water supply program, as evidenced by the decreasing percentage of budget and manpower devoted to the program. In 1960 about 1.4 man-years, representing 70% of the total effort, were being used for public water supply activities. However, by 1972 this had declined to 0.7 man-years, representing only 14% of the total effort. This decline has occurred in spite of the steadily increasing number of public water supplies and surveillance responsibilities and has resulted in an ineffective program.

The FY 72 budget of $29,000 only amounts to about $270 for supervision of each of the 107 public water supplies in Wyoming, or about nine cents per capita. In comparison, approximately three times that amount was allocated for water pollution control. Contrary to popular belief, an extensive water pollution control program does not assure that the public will receive safe drinking water. Water pollution control is important, but a strong water supply program is just as important and should receive a comparable level of funding and manpower.

The engineering activities and responsibilities concerning public water supplies, as outlined in the previously stated regulations are:

Table 7

Sanitary Engineering Services

Estimated Resources
Fiscal Year 1971 & Fiscal Year 1972 [a]

Fiscal Year 1971					Fiscal Year 1972			
Activity	Expenditure [b]	% of Total	Man Years	% of Total	Budget [b]	% of Total	Man Years	% of Total
Water Pollution Control	54,000	67%	2.5	62%	66,000	58%	3.0	60%
Solid Wastes	8,000	10%	0.6	15%	26,000	23%	1.3	26%
Public Water Supply [c]	19,000	23%	0.9	23%	22,000	19%	0.7	14%
Total	81,000	100%	4.0	100%	114,000	100%	5.0	100%

[a] - Does not include resources of the Environmental Surveillance and Control Services allocated to semi-public and private supplies which is discussed on page 64

[b] - Includes federal program grant funds

[c] - Laboratory support not included. For public water supply this amounts to about $7000 annually, therefore the actual totals are: FY 71 = $ 26,000
FY 72 = $ 29,000

1. Engineering inspection of facilities and operation of all public water supplies.
2. Review of plans and specifications for new construction and modification of existing systems.
3. Setting rules and regulations to secure the protection of domestic water supplies.
4. Enforcement of sanitary standards (including the Drinking Water Standards) to protect quality of water served to the public.
5. Surveillance of the quality of the water being served to the public.

In addition, other services are performed, including:

1. Training of water plant operators.
2. Assistance to the Environmental Surveillance and Control Services, and the local health departments for surveillance of semi-public and individual water supplies.
3. Assistance to other state agencies.
4. Promotion of good water treatment practice, such as the keeping of adequate operating records, etc.

Sanitary Engineering Services has set a general unwritten policy of providing a minimum of one inspection and report per year for all public water supplies. However, staff and budget limitations never have allowed this policy to be implemented. During 1971, only 9% of the 107 supplies had a formal inspection (including a report) and only 36% had an informal visit by an engineer. Twenty-seven percent of the systems have not had an engineering evaluation since 1967. In addition, the Department estimates that there may be up to 70 public water supplies which they even do not have listed, therefore are not under surveillance. Twelve of these supplies were evaluated during the study and found to have more deficiencies than the other systems surveyed. Sanitary Engineering Services has not had the staffing necessary to inventory all the public supplies and maintain an effective surveillance program.

Well-written reports, outlining the findings and recommendations of the routine water supply inspections, are essential to obtain desired improvements. However, very few reports are prepared (only ten were written during 1971) by the engineers. Many of the reports which have been prepared were sent back to the communities three to eight months after the survey, which is not an effective approach to surveillance. A report should be submitted to the community within a month of the survey, while the findings and recommendations are still fresh in the minds of the engineer and water plant operator. After the initial inspection, follow-up surveys are important in order to determine if the operator has understood and properly implemented the recommendations of the report. Here again, there is not enough staff-time available for adequate follow-up consultations and investigations.

Since there are few formal inspections and follow-up surveys, very little enforcement is accomplished, as indicated by the large number of supplies which do not provide disinfection and consistently fail the bacteriological quality standards. Where changes are implemented, the engineer might not return for another year to verify that proper action was taken. Enforcement of the Drinking Water Standards is hampered by the lack of laboratory facilities and staff to do chemical analyses of water. Generally, it is the small communities that do not meet the standards or comply with the State's recommendations as shown by the results of this study.

Surveillance of the quality of water being distributed by the public systems is limited to bacteriological analyses because of lack of a suitable chemical laboratory. All public systems are required to submit samples for bacteriological analysis each month. Each engineer receives a monthly computer printout of the bacteriological results for his district. This is an excellent reporting system which does away with time-consuming bookkeeping procedures. The laboratory also sends reports to the engineers on unsafe samples on a day-to-day basis. The engineers are then responsible for following-up on the unsafe results and requesting resamples. Also, they are responsible for seeing that the systems are submitting the proper number of samples as required by the Drinking Water Standards. At the end of each year, a summary of the bacteriological data is reviewed by the engineers and each town is rated safe, unsafe or questionable. The questionable rating is used when an insufficient number of samples are submitted. During 1971, 35% of the public supplies failed to submit the required number of samples for two or more months which definitely should not be allowed to continue. A review of the bacteriological records also revealed that very little resampling (as required by the Drinking Water Standards) or investigation was done after the first samples showed contamination; indicating a need for more thorough follow-up by the engineers. Further illustrating this need is the fact that of the 35 unsafe supplies in 1971, 15 have been so rated for at least three years. These are small communities which provide no water treatment and generally have made no attempts to do so.

The importance of routine surveillance of the communities which fluoridate their water supplies cannot be overstated. Frequent check samples of fluoride levels in the systems and regular inspections of the fluoridation installations must be conducted to assure the facilities are operating correctly.

The records reveal that only minimum surveillance actually is being accomplished. None of the six fluoridated systems submitted routine check samples to Sanitary Engineering Services in either 1970 or 1971. Even when an occasional sample was submitted, the results would not be sent back to the community for three or four months, making them useless. Two of the supplies had a formal inspection during 1970 and two in 1971. The other two have not been surveyed since 1968. These systems should be inspected at least twice a year, especially in view of the deficiencies noted during the study.

Sanitary Engineering Services does not require the public water supplies to submit periodical operational reports. In fact, most of the supplies do not maintain adequate records relating to the operation and maintenance of their systems. Good records are essential to the operation of any water system. Monthly operation logs (a standard form could be developed easily) submitted to Sanitary Engineering Services could provide valuable information concerning source capacities, treatment and consumption volumes, operating costs as well as indicating problems with which the supply needs assistance.

Obviously, more effective surveillance action is needed in order to help the communities improve the condition, operation and maintenance of their water supplies. More formal inspections, as well as follow-up work on inspection and bacteriological reports are needed to isolate and correct the serious deficiencies. The present Water Supply Program simply does not have the resources to perform these functions adequately.

The study results have shown a great need for an active program for training waterworks operators. During the past 20 years, the State's operator-training activities have been limited to co-sponsoring the Rocky Mountain Water and Wastewater Plant Operators School. Since the school is held in Denver, Colorado, only the larger communities send their operators. In recognition of the great need for training operators of small public water supplies, a program was started in 1971 under a contract with the consulting firm, Environmental Engineers of Wyoming. A basic fundamentals (water and wastewater) course, providing 18 hours of instruction, was given at seven different locations throughout the State. A total of 70 operators attended these courses. The goal of this program was to provide sufficient training so that a voluntary certification program could be started and examinations for the lowest or "D" level could be passed. To date, about 64 operators have been certified at the "D" level. Thirty states have mandatory certification programs which require the water utilities to have a certified operator. Once the voluntary program is established in Wyoming, it could be phased into a mandatory program, with proper legislation, which would insure that capable, trained personnel would be operating the public water supply facilities.

All public and semi-public supplies are required by law to submit plans for the construction of new water and wastewater systems as well as for modifications to existing systems. About 147 sets of plans and specifications were reviewed during 1971. This activity involves detailed calculations requiring a large amount of time. A concentrated effort is made to carry out this required activity, often at the sacrifice of other important functions. Very little inspection of actual construction projects is done.

Sanitary Engineering Services has not established any written rules or regulations governing public water supplies although they have the power to do so. In light of the study results, meaningful regulations definitely are needed and with additional staff-time, could be developed. Standards have been adopted for fluoridation of public water supplies but are poorly enforced.

Advisory service to local health departments and other state agencies regarding water supplies is minimal, except in emergency situations. The study results indicate more technical assistance is needed badly in the surveillance of semi-public and private water supplies.

Laboratory Support - Bacteriological

The Public Health Laboratory Services (Disease Prevention and Environmental Control Section) performs all the bacteriological testing for public water supplies. The laboratory facilities and procedures were evaluated during the study. The complete report is included in Appendix J. The report concluded that the laboratory generally met the provisions of the Standard Methods for the Examination of Water and Wastewater, however, the space provided for water bacteriology was insufficient, especially during peak periods.

The laboratory examined about 4900 samples from public water supplies during 1971. No charge is made to either the supplies or Sanitary Engineering Services for the analyses. The results are sent to Sanitary Engineering Services for any necessary action by the engineers.

Laboratory Support - Chemical

The Department of Health and Social Services does not have any capability whatsoever to do chemical analysis of drinking water. Therefore, there is no routine surveillance of the chemical quality of the water being distributed by the public supplies. As indicated by the summary in Appendix B, only four supplies (before the study) had a complete chemical analysis performed on their water. A partial analysis was conducted on samples from 76 supplies in 1962; however, the only constituents determined were total dissolved solids, total hardness, alkalinity, sulfates, iron and fluorides. This hardly constitutes an adequate analysis since none of the chemicals which can cause adverse health effects were included. This lack of information can result in serious problems. For example, the chemical tests performed during the study revealed that two public supplies had selenium in excess of the mandatory limit of the Drinking Water Standards. It is quite possible that similar situations exist in other communities. Surveillance of the communities fluoridating their water supplies practically is non-existent due to the lack of proper laboratory facilities, as was discussed earlier. The engineers must run the fluoride check samples when they have time and the results do not get back to the communities until after three or more months.

The Wyoming Department of Agriculture has a very well equipped laboratory located on the University of Wyoming campus in Laramie. The laboratory is under the direction of the State Chemist. This laboratory has the capability of doing complete chemical analyses of water and will do so at the request of Sanitary Engineering Services. Unfortunately, the laboratory has a tremendous workload due to its primary responsibility to analyze milk, foods, fertilizers, pesticide formulations, and irrigation waters. In addition, it does water analysis for the U. S. Geological Survey, State Fish and Game Commission, and the Atomic Energy Commission. There simply is not enough time for the laboratory to perform routine chemical analysis of drinking water. An evaluation of this laboratory and its capabilities is included in Appendix K.

Environmental Surveillance and Control Services

The primary programs assigned to the Environmental Surveillance and

Control Services are food protection, general sanitation, private and semi-public water supplies as well as sewage disposal. Others include giving assistance to the water pollution control program and local health departments. The major activities are the inspection and review of plans and specifications for food service establishments, schools, hospitals, nursing homes, resorts and camping areas.

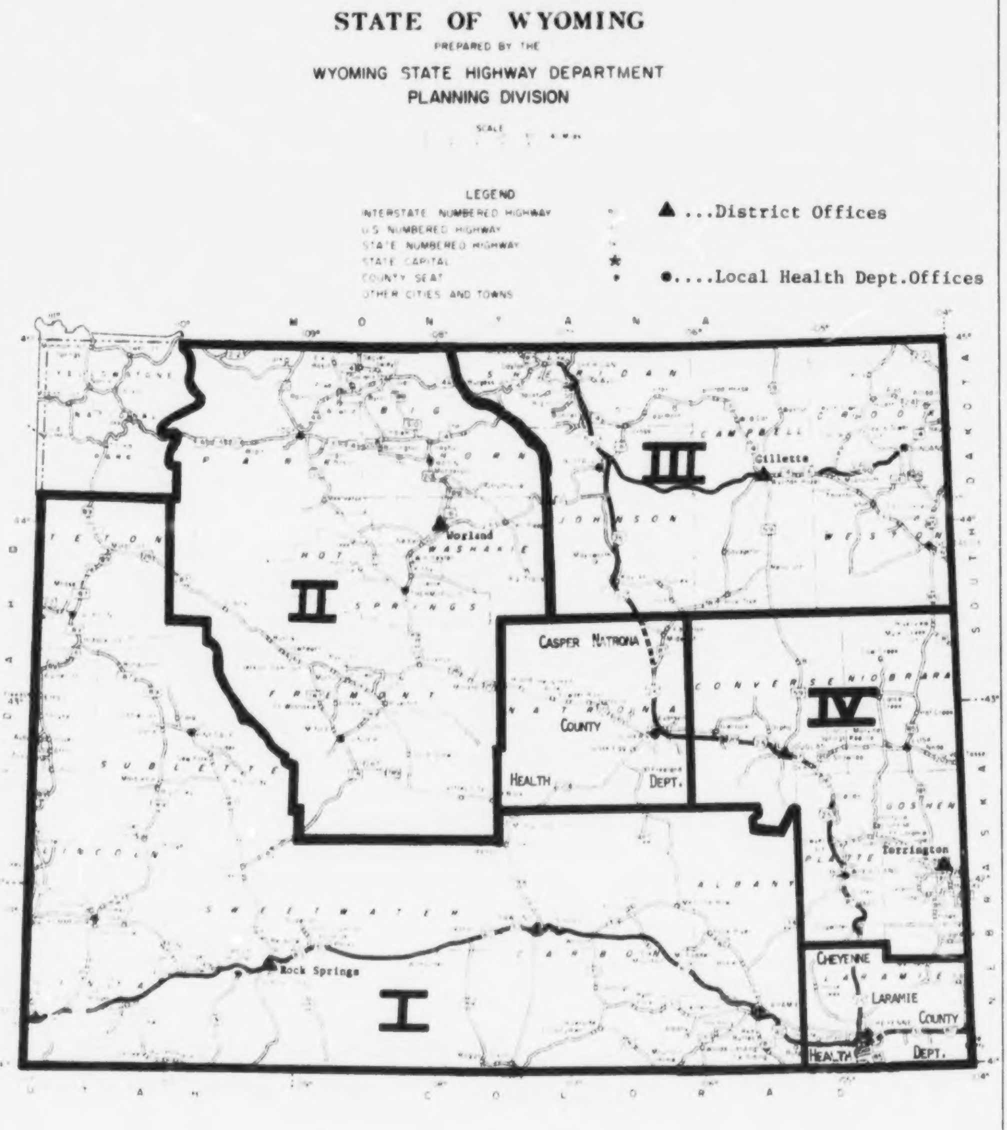
Presently, the staff consists of a director located in Cheyenne, four district sanitarians, three sanitarian technicians and three secretarial positions. The fiscal year 1971 budget was about $115,240. Approximately one man-year and $10,000 was allocated to semi-public and private water supplies. The districts covered by the sanitarians, shown by Figure 8, are quite large and personnel provided is not sufficient to allow an acceptable level of public health protection,especially in regard to semi-public and private water supplies.

For the most part, very little is known about the actual number of semi-public supplies or the quality of water they are serving. It is estimated that there are 600 semi-public supplies currently and that they are increasing at a rate of 60 - 70 supplies each year. The study results indicate they need much more surveillance. Of the ten semi-public systems surveyed in the two counties served by district sanitarians (Campbell and Lincoln), only three had an inspection in the last two years.

The only semi-public supplies required to submit samples for bacteriological testing are those which must have a permit from the Environmental Surveillance and Control Services in order to operate. This group includes only restaurants, dude ranches, resorts and mobile home courts. Generally, only one sample is submitted each year from these supplies which is inadequate, considering the number of people served. Many supplies are not sampled unless visited by a district sanitarian which could be only every two or three years. The State does require four samples a year from mobile home

Figure 8

Districts of Environmental Surveillance and Control Services


STATE OF WYOMING
PREPARED BY THE
WYOMING STATE HIGHWAY DEPARTMENT
PLANNING DIVISION
SCALE
LEGEND
INTERSTATE NUMBERED HIGHWAY
U.S. NUMBERED HIGHWAY
STATE NUMBERED HIGHWAY
STATE CAPITAL
COUNTY SEAT
OTHER CITIES AND TOWNS
▲ ...District Offices
●....Local Health Dept.Offices
MONTANA
SOUTH DAKOTA
NEBRASKA
COLORADO
UTAH
IDAHO
I
II
III
IV
Worland
Gillette
Torrington
Rock Springs
CASPER NATRONA COUNTY HEALTH DEPT.
CHEYENNE LARAMIE COUNTY HEALTH DEPT.
PARK
BIG HORN
SHERIDAN
CAMPBELL
CROOK
JOHNSON
WESTON
WASHAKIE
HOT SPRINGS
TETON
FREMONT
NATRONA
CONVERSE
NIOBRARA
GOSHEN
PLATTE
SUBLETTE
LINCOLN
SWEETWATER
CARBON
ALBANY
LARAMIE

courts but this is enforced poorly. Of seven courts surveyed in all three counties, only one was complying with the requirement. The semi-public supplies which do not need permits, such as Forest Service campgrounds, State campgrounds and State roadside parks, rarely if ever, are sampled. In short, the sanitarians simply have not had the time available to do an adequate job of routine inspection, especially in light of their numerous other responsibilities. When the district sanitarians do inspect an establishment with its own water supply, they do not perform a complete sanitary survey of the source or system. The reason for this is they do not feel they have sufficient knowledge of well construction, cross-connections,etc., to do an adequate evaluation. Of course, this is where technical assistance from Sanitary Engineering Services would be valuable. However, as mentioned previously, the engineers to not have sufficient time to render much technical assistance except in plan review. The State does not require the supplies to submit samples for chemical analysis; therefore it is reasonable to assume that none of the 600 semi-public systems have had an adequate chemical test (including those constituents shown in Table 3) performed. This means that some of these supplies could be serving water containing toxic substances.

The study showed that the individual water supplies also need more attention. Generally, the people interviewed (74 in Lincoln and Campbell Counties) knew very little about their respective wells or springs. Many did not know where or how to send water samples for testing or that a district sanitarian even existed. Only 16% ever had submitted a sample to the State for bacteriological testing. None of them had a complete chemical analysis of their water and few ever had a partial analysis.

The bacteriological testing for private and semi-public supplies is done by the Public Health Laboratory Services in Cheyenne and the district sanitarians, (using membrane-filter field kits) at no charge. Once again, chemical analysis is a problem because of the lack of facilities. The Department of Agriculture Laboratory in Laramie runs a simple chemical and bacteriological test for $2.00. However, the constituents tested for (hardness, alkalinity, sulfates, iron and fluorides) do not include any of the chemicals which can cause serious adverse health effects.

Local Health Departments

Only two of the 23 counties in Wyoming have local health departments (Figure 8). These are:

1. Casper-Natrona County Health Department - located in Casper with an environmental health staff consisting of a sanitarian director, a sanitarian, a sanitarian aide and a secretary.
2. Cheyenne-Laramie County Health Department - Located in Cheyenne with an environmental health staff consisting of a sanitarian director, a sanitarian and a secretary.

These two departments have the same responsibilities on the county level as the district sanitarians have on the state level. The local departments provide a more comprehensive and effective surveillance program because they have a much smaller area to cover, which enables them to devote more time to private and semi-public supplies. This is well illustrated by the fact that Natrona County had a much lower percentage of contaminated wells than the other two counties studied, which probably was due to two factors:

1. An intensive surveillance program of private supplies. For example, of the 53 sources surveyed, 58% had a bacteriological test done within the past year, as compared with 16% in the other two counties.

2. Rigid enforcement of a septic tank permit system which insures that the tanks are installed correctly and at a proper distance from water supplies.

The semi-public supplies are inspected also (including bacteriological testing) more frequently than in the counties served by the State's district sanitarians.

Other Agencies

Wyoming State Engineer - Charged with protecting the State's ground water resources. To accomplish this, a well permit system was established in 1969. For wells drilled after December 1, 1969 a permit must be obtained before construction can begin. Information concerning the depth, diameter, capacity and log must be submitted after completion. Minimum construction standards for wells became effective July 1, 1971, and all wells drilled after that date must meet them. Unfortunately, there are enforcement problems and as the study results indicate, the standards are not being met.

Wyoming Department of Agriculture (Division of Food and Drugs) - Responsible for surveillance of bottled water producers. Presently, there are only two such producers in the State and their water meets the applicable standards.

National Park Service - Responsible for the supervision of the 44 water supplies within the boundaries of Yellowstone and Grand Teton National Parks, Fort Laramie National Historic Site, Bighorn Canyon Recreation Area and Devil's Tower National Monument. A listing of these supplies is included in Appendix L. Most of them are disinfected and rated as satisfactory.

Environmental Protection Agency - Under the Federal Interstate Quarantine Regulations, the EPA must survey and classify those water supplies providing water to interstate carriers. This program consists of a joint EPA-State survey every three years and a State survey during the intervening years. A supply is classified as either "Approved", "Provisionally Approved" or "Prohibited" based on the adequacy of the supply to provide water meeting the Drinking Water Standards. Cheyenne and Green River currently are listed as interstate carrier water supplies and are rated "Provisionally Approved" for deficiencies present within their systems.

Farmers Home Administration (FmHA) - Provides loans and grants to rural communities and water districts (serving less than 5,500 people) to construct water supply facilities. The FmHA coordinates their projects with Sanitary Engineering Services and submits all plans for approval.

Indian Health Service (Public Health Service - Department of Health, Education and Welfare) - Responsible for the construction and surveillance of water supplies on the Wind River Indian Reservation. Plans are submitted to the State for approval and the communities submit samples for bacteriological testing.

Public Health Risk

Since the middle of the nineteenth century, when Dr. John Snow did his classical study on the transmission of cholera through a water supply, it has been recognized generally that disease epidemics can, and do, result from consumption of water containing pathogenic microorganisms. Diseases most commonly associated with drinking water are cholera, typhoid fever, dysentery, and infectious hepatitis. Spread of these diseases occurs most often when body wastes from the infected persons are ingested.

While person-to-person contact is recognized as the common method of transmission for low incidence levels currently found in this country, the potential for catastrophic epidemics transmitted by drinking water supplies which serve thousands of people, remains and demands constant vigilance.

Human body wastes from infected person(s), when present in inadequately treated drinking water, have caused waterborne disease outbreaks in Wyoming. A total of two outbreaks involving public water supplies and two involving semi-public or individual systems, have been reported during the last ten years. Fortunately, none of the outbreaks resulted in a fatality. In 1961, 17 people contacted infectious hepatitis in the community of Meeteetse. Epidemiological evidence indicated that there had been a back-siphonage of sewage into the water system and that the chlorination was inadequate. Six residents of a trailer court near Riverton and four people at Fort Washakie were stricken with infectious hepatitis during the summer of 1962. Well water contaminated with septic tank effluent was reported to be the source of disease transmission in both incidents. The most recent reported waterborne disease outbreak occurred in the summer of 1970 when 150 people at Paradise Valley (near Casper) suffered a severe salmonellosis attack. An investigation revealed that sewage was contaminating the well water and chlorination was not being practised. Significantly, 41% of Wyoming's public water supplies are not chlorinated and 33% failed the bacteriological quality standards in 1971. Indications are that very few, if any, of the semi-public supplies are chlorinating and the bacteriological quality of this water is unknown, for the most part. Obviously, a public health risk does exist in Wyoming.

While epidemiological records generally do not show widespread incidence of waterborne disease, this actually may reflect incomplete reporting, inaccurate diagnosis and the fact that much enteric illness is not treated by physicians. This had led some authorities to suggest that cases of such diseases as gastroenteritis and infectious hepatitis actually may be as many as 100 times the number reported.

Appendix M presents a tabulation of significant, potentially waterborne diseases, and a comparison of the number of cases in Wyoming versus the number occurring nationwide for the past ten years. While Wyoming has approximately 0.16 percent of the nation's population, it had for the period 1962 - 1971:

1. 0.05 percent of the total number of reported cases of amebiasis.
2. 0.15 percent of the total number of reported cases of viral hepatitis.
3. 0.02 percent of the total number of reported cases of salmonellosis.
4. 0.02 percent of the total number of reported cases of shigellosis.
5. 0.41 percent of the total number of reported cases of typhoid fever.

During the last five years, the average case rate of typhoid fever in Wyoming was 1.1 per 100,000 population, which is over six times the national average for the same period.

This data is not intended to imply that all reported cases were waterborne. It is intended, however, to point out that a portion of these cases, plus an unknown number of unreported cases, may have been waterborne. In addition, it is significant to note that body wastes from these diseased persons pose the constant threat of contaminating public drinking water with pathogenic microorganisms.

In recent years, concern also has been directed to the possible chronic diseases which may result from use of water containing certain elements and chemicals. These potentially dangerous substances include heavy metals, pesticides and toxic industrial products. Although few clinical cases are recorded, health agency statistics are limited usually to communicable diseases and affected individuals may have unrecognized symptoms. The heavy metals, such as selenium, cadmium, lead, zinc and arsenic, occur naturally in the earth, therefore they can be present in water sources. Certainly, it is evident that every water supply serving the public should have an adequate chemical analysis (including all the constituents shown in Table 3) performed routinely. Ninety-six percent of Wyoming's public water supplies never have had an adequate chemical analysis. The same is true of the semi-public supplies. The State clearly is not meeting its responsibility to protect the health of its citizens and visitors.

In essentially all documented cases of waterborne illness, it has been shown that definite deficiencies existed in the water supply systems during the time when disease was transmitted. Furthermore, these deficiencies either were unrecognized because of inadequate surveillance for public health hazards, or were recognized but not remedied due to ineffective persuasion or enforcement by health officials. Deficiencies similar to those responsible for epidemics definitely are present in the water supplies of Wyoming and were found during this study. The requisites for repetition of the tragic waterborne outbreaks of the past, namely inadequate surveillance of water supplies serving the public and the presence of diseased individuals, definitely exist in Wyoming. Greater vigilance and concern by Wyoming's health officials, water supplies and citizens alike, is called for in order to minimize public health risks from drinking water.

PROGRAM NEEDS

The previous sections present the study findings and how they relate to the current status of the Water Supply Program in Wyoming. There is a definite need for a much stronger Program, especially in terms of surveillance, laboratory capabilities, and operator training.

The importance of a strong Water Supply Program to the health of the State's citizens and visitors cannot be over-emphasized. As the State grows and more developments, such as in the Star Valley, are planned, the Program must have the resources to insure that the water supplies serve safe and wholesome water. This section will discuss what is needed to give Wyoming an adequate Water Supply Program.

Authority

The Wyoming statutes provide the Department of Health and Social Services with broad regulatory powers to inspect all public water supplies, set standards and regulations to protect the quality of water served to the public, and to issue orders for correction of water system defects which cause health threats.

The statutes (Section 35-197b) define a public water supply as "any water supply being distributed by ten or more service connections..." Although this does allow surveillance of small systems, including semi-public supplies, a large number of semi-public systems are not covered. For example, a campground may have only five service connections but could serve thousands of people each year. Obviously, this type of system also needs surveillance to prevent public health problems. Therefore, it is recommended that the definition of a public water supply be changed to include all systems serving the public.

The Department has the authority to make rules and regulations to secure protection for public water supplies (Section 35-185) which would appear that disinfection, and/or other minimum treatment, could be required on public supplies. Although this is done to some extent in the plan approval process, such requirements would be much more effective if they were published as specific regulations outlining minimum acceptable treatment for general types of water sources. In this manner, the regulations also would apply to existing supplies For example, all public supplies should be disinfected regardless of their water quality, and all surface sources should receive a minimum of filtration and disinfection. If the Department feels that Section 35-185 does not provide them with such authority, specific legislation is needed.

The authority to set and enforce standards for the protection of public health as to the quality of water supplied to the public, is granted by Section 35-25. However the standards must be established by law. The only ones so established are the bacteriological limits of the Drinking Water Standards (Section 35-198). In other words, the Department cannot enforce any physical or chemical standards, or disapprove a public water supply based on unsafe chemical quality. An effective approach to this problem would be to grant the Department, through proper legislation, the authority to adopt drinking water standards. If this is not accomplished, the legislature should adopt the latest revision of the Drinking Water Standards in total.

There are prescribed penalties for violating provisions of the public health laws, but they are confusing. Violations of authorized standards and certain regulations can result in fines up to $1000. However, if a

Departmental order issued under the provisions of Section 35-198 (to correct sanitary defects, improve operation or provide necessary treatment to insure safe water) is violated, apparently only a $100 fine can be assessed. All in all, the penalty provisions, when applied to the drinking water statutes require a great deal of interpretation and are inadequate in most cases. The use of penalties is distasteful in public health work and the Water Supply Program must be commended for the progress they have achieved in improving the communities' water supply practices without the use of force. Unfortunately; there are those who refuse to implement the Program's recommendations. Ten communities have been rated unsafe for the last two years, and four since 1963. Such cases call for stronger and more effective State action. The use of the monetary penalties described above is ineffective and time-consuming. There must be some swift means of enforcement which the Department can take if an order is not being implemented and public health is being endangered. One method, which is well within the Department's jurisdiction, would be to have the Environmental Surveillance and Control Services suspend all permits issued to any food service establishments using those water supplies in violation. The permits would be reissued once the supplies were in compliance with the Department's orders. The Department also could issue public notices outlining the deficiencies of the water supplies in violation and advising the citizens not to use those supplies until they are in compliance. These two actions would bring immediate pressure upon the communities to correct the deficiencies in their water supplies which is clearly in the best interests of public health.

There is a definite need for the establishment and adoption of a State plumbing code which would serve as minimum requirements for all communities.

The code would control connections to water distribution systems, thereby providing a basis for eliminating hazardous connections. The lack of a code makes it impossible for the Department to enforce any form of a cross-connection control program. Cross connections (any physical arrangement between two otherwise separate piping systems connecting a source of contamination with a potable water supply) can occur in any distribution system and are a leading cause of waterborne disease outbreaks in public water supplies. Excellent water treatment avails nothing if the distribution system permits entrance of contamination through cross-connections. For these reasons, an adequate plumbing code and active cross-connection control program are essential to public health protection.

The voluntary operator certification program should be phased into a mandatory program by means of proper legislation. This would help assure that community water supplies are being operated by trained personnel. So as not to impose hardships on the small communities, a population limit and time-lag could be established. For example:

a. Municipal supplies serving more than 1500 people must have a certified operator within two years after passage of the law.

b. Municipal supplies serving 500 to 1500 people must have a certified operator within four years after passage of the law.

c. Municipal supplies serving less than 500 people, not required to have a certified operator but encouraged to do so.

In view of the considerable benefits of fluoridation, it is recommended strongly that Wyoming pass legislation requiring fluoridation of community water supplies serving more than 500 people. Proper fluoridation techniques could be incorporated easily into the operator training and certification program. Once again, a population limit and time-lag could be built into law to lessen the impact on the smaller communities.

No specific provision is included in the Act for the promotion and orderly development of new public water supplies. There seems to be a proliferation of water companies in certain areas of the State. Such unplanned development often leads to small, inefficient water systems which receive inadequate operation and maintenance. This has occurred in the Star Valley with the many pipeline companies. In order to assure optimum utilization of the land and water resources, legislation requiring comprehensive community planning would be helpful. The community plans would provide for the orderly expansion and extension of community water supply and sewerage systems in a manner consistent with the needs of each area.[8]

Although the authority granted to the State Engineer to enforce minimum water well construction standards (Section 41-126) is a step in the right direction, additional legislation is needed to require licensing and certification of drilling contractors. This is the the only effective way of adequately enforcing the construction standards. Reportedly, such a provision will be part of a recodified water law to be presented to the next legislature.

Regulations

Clearly, the Water Supply Program needs to develop and publish specific regulations dealing with the development, construction, treatment and operation of public water supplies. The present lack of well-defined regulations has caused problems for Water Supply Program staff, waterworks officials and consulting engineers. Specifically, regulations are needed concerning the following areas:

1. Adoption of the latest revision of the Drinking Water Standards. This would be contingent upon the legislature granting such authority to the Department.
2. The proper development and planning of new public water supplies and modifications to existing supplies. The regulations should require that waterworks design and/or the preparation of plans and specifications must be by a professional engineer registered in Wyoming. A minimum time period when plans and engineering reports should be submitted before action is desired, should be set as well as criteria outlining what the engineering report should contain. For example, the adequacy of the proposed water supply source, in relation to current and reasonable future demands, should be included.
3. Minimum acceptable treatment for source waters. Disinfection of all systems and filtration of all surface sources should be required.
4. Raw water quality standards should be developed in order to evaluate proposed domestic water supply sources. Standards presented in the Manual for Evaluating Public Drinking Water Supplies [3] are recommended.
5. Minimum design requirements for water treatment and distribution systems should be developed. For example, acceptable filtration rates for the various types of media, minimum detention period for sedimentation, minimum sizes of distribution pipe, storage requirements and acceptable coatings for water storage tanks should be covered. Disinfection requirements are particularly important since the majority of Wyoming supplies use this as the only means of treatment. Regulations should specify acceptable equipment capacities,

minimum contact time, point of application, standby equipment requirements, detectable free chlorine residual be maintained in all parts of a distribution system, and the test procedure to be used for monitoring the chlorine residual. Disinfection of all newly constructed waterworks, extensions, modifications, or major repairs should be mandatory. Facilities should be withheld from service until bacteriological samples indicate that satisfactory disinfection was achieved.

6. All public water supplies should be required to have a bacteriological test, chemical analysis and engineering inspection before being placed into service.
7. All public water supplies should be required to submit operating reports on a periodic basis to the Water Supply Program.
8. Require that a legally constituted group be designated responsible for each public water supply.
9. Minimum well construction standards, concentrating on sanitary protection, to be used in conjunction with the State Engineer's requirements, need to be developed for public water supplies.
10. The present "Standards Governing Fluoridation of Water" should be incorporated into the Regulations. They are adequate but are not being enforced. Communities which fluoridate definitely should be required to submit routine check samples for analysis.

It was recommended earlier that the legislature change the definition of a public water supply to include all supplies serving the public. If this is done, the semi-public supplies will be subject to the Regulations described above. However, if this is not done, the existing Minimum Standards for Private or Semi-Public Water Supplies[9] need to be updated and strengthened. Specific regulations are needed requiring the following for all semi-public supplies:

1. A complete chemical and bacteriological analysis on any water source before it is used.
2. An engineering inspection and approval of the facilities before a water system is put into service.
3. Routine bacteriological sampling and facilities surveillance.
4. Disinfection of all water sources.
5. Fencing of all spring supplies.

Water Supply Program

The findings of this evaluation and planning reports by Sanitary Engineering Services and the Environmental Surveillance and Control Services all emphasize that the Wyoming Water Supply Program is not fulfilling its responsibilities. Due to pressing committments in other environmental areas, the Water Supply Program has deteriorated steadily. The survey findings indicate a serious lack of surveillance of public and semi-public water supplies which has resulted in many sub-standard supplies as well as potential public health problems. The survey revealed a large percentage of unprotected sources of supply, deficient treatment facilities, faulty treatment operation and inadequate cross-connection control.

The water supplies which fluoridate are receiving little surveillance. Major deficiencies in facilities equipment and operational practices were found in the systems thought to be providing a dental health benefit.

The operator training effort is just starting and certainly needs to be expanded. Very few of the operators of the systems surveyed had an adequate knowledge of the treatment processes of which they were in charge or their importance.

The lack of staff has necessitated compromises from optimum program practice which has affected the entire program adversely. Not only are important program activities at times not performed, but due to the lack of resources much work which is done has become so routine as to be ineffective. Many engineering inspections are little more than "visits to the water plant". Inspection reports are rarely written and return inspections to review compliance with directives are seldom made. Effective action against unsafe supplies has not been taken. Many small public supplies and the vast majority of semi-public supplies are not even listed. In short, the Water Supply Program, as presently conducted, is inadequate and has created a false sense of security regarding the reliability of water systems in Wyoming.

The surveillance activities must be upgraded. An obvious need is for an inventory to be conducted of all public and semi-public supplies. These supplies should be inspected at least once each year. A written report should be returned to each supply within a month of the survey. The supplies which fluoridate or have serious deficiencies should be surveyed more frequently. Routine samples for chemical analysis and more thorough follow-up on insufficient or unsafe bacteriological results, should be required. More effective action needs to be taken with the supplies being rated unsafe consistently.

Organization

At one time the Water Supply Program was one of the most important activities within the Department. During the last ten years, there has been a steady de-emphasis on the Program as typified by the conditions outlined in this report. However, the fact that a strong Water Supply Program is essential to the health and well-being of every Wyoming resident and visitor cannot be ignored. In view of this importance, it is recommended highly that a Water Supply Branch be formed within Sanitary Engineering Services to be responsible for all activities concerning public, semi-public and private water supplies. In this manner a more responsive and coordinated effort could be directed toward improving the State's water supplies.

Personnel Requirements

The primary need of the proposed Water Supply Branch will be sufficient personnel to implement an effective program. Given this, a secondary need will be to evaluate and redirect existing program activities. The staffing needs will consist of qualified personnel to carry on the surveillance, planning and technical activities of the Branch plus secretarial support.

Public Health Service experience indicates that an average of 1.2 man-days, per public water supply, is needed to make a comprehensive field survey of facilities and operation. This single visit-time-requirement does not include making arrangements for the field work or preparation of written survey reports. Moreover, it does not include the essential follow-up work with the local officials developing facilities' improvement programs or activities related to operator training and certification. These are necessary if the program is to be successful in securing proper facilities and effective operations. Therefore, it has been estimated that, on the average, at least four man-days are required for each public water supply for plan reviews, surveys, report preparation, training, etc. [1] Cross-connection control activities are excluded from this estimate because this activity is related primarily to distribution system size.

Indications are that actually there are more public water supplies than the 107 listed by the State. Twelve additional supplies were located during the study and there may be as many as 60 not yet listed. However, for purposes of estimating personnel requirements a figure of 140 public water supplies was used.

It was assumed that one man-day per year would be required for each semi-public supply which also allows time for work with private water supplies. Although little is known about the actual number of semi-public supplies, 600 was used for estimating the personnel requirements. This figure was based on the number of trailer parks, roadside parks, recreational areas, dude ranches, resorts and schools with their own water supplies.

In summary, the following assumptions were used to estimate the personnel required for an optimum water supply program for Wyoming:

1. 140 public water supply systems.
2. Four man-days per public water supply per year.
3. Cross-connection control requirements for public water systems based on the following:[10]

Population Served	Engineering Time Man-Days / System / Year
10,000 to 99,999	3
1,000 to 9,999	2
Less than 1,000	1

4. 600 semi-public water systems.
5. 1 man-day per semi-public supply per year.
6. 225 man-days equals one man-year.

Using these assumptions, the annual personnel requirements are:

1. Public Water Supply:

   a. 140 systems x 4 man-days per system equals 560 man-days.

   b. Cross-connection Control:

Population Served	Number of Systems	Man Days/ System/Year	Man-Days/ Group/Year
10,000 to 99,999	5	3	15
1,000 to 9,999	29	2	58
Less than 1,000	106	1	106
	140		179

2. Semi-Public Water Supply:

   a. 600 systems x 1 man-day per system equals 600 man-days.

The total annual personnel requirements for public water supply activities are 739 man-days or 3.3 professional man-years. The requirements for the private and semi-public activities are 600 man-days or 2.7 professional man-years. Therefore, the proposed Water Supply Branch would have a total of six professional man-years which would triple the present effort in water supply activities. One position would be used to serve as Chief of the Water Supply Branch. Three secretarial positions would be needed also to provide adequate support services. Not all of the professional positions would have to be engineers. Sanitarians or engineering technicians could be trained for much of the semi-public surveillance and inventory activities.

In order to make the water supply activities more responsive to the needs of the communities and people, it is recommended that the Water Supply Branch be decentralized. At least one position should be placed in each of the district offices (Rock Springs, Worland, Gillette and Torrington) of the Environmental Surveillance and Control Services. This would result in significant improvement in the quality of service provided to all portions of the State as well as increased ability to respond to emergencies and problems. Savings on travel-time and expenses could be realized also.

Laboratory Support - Bacteriological

The importance of a strong bacteriological testing program was stressed by the survey findings. The evaluation of the present laboratory facilities concluded the procedures being followed complied with Standard Methods. However, the space devoted to water bacteriology is inadequate and must be used also for clinical diagnostic examinations. This results in cramped conditions for processing and examining water samples, especially during peak work-periods.

Reportedly, the Department will have expanded laboratory facilities in the new State Office Building, presently under construction. Therefore it is recommended that the water laboratory be separated physically from the diagnostic laboratory and a suitable working environment be provided.

Increased emphasis on requiring the public and semi-public supplies to submit the proper number of samples and more strict enforcement of the well construction standards could result in an additional 3000-4000 bacteriological samples per year. To facilitate the prompt analysis of the samples, the employment of an additional bacteriologist is recommended.

The laboratory and statistical personnel are to be commended for their handling of the bacteriological results. The monthly printouts of the data frees the engineering staff from bookkeeping procedures and provides them with a valuable surveillance tool.

Laboratory Support - Chemical

For all practical purposes, there is no chemical surveillance of drinking water quality in Wyoming due to the complete lack of laboratory facilities and staff. The serious nature of this problem was illustrated during the survey when two public supplies were found to exceed the mandatory standard for selenium. Other similar situations well could exist within the State.

The dependence of the Water Supply Program on the State Agriculture Laboratory at Laramie certainly precludes a comprehensive drinking water surveillance program. The Agriculture Laboratory is well equipped and staffed with competent personnel but their priorities and lack of resources simply do not allow them to give adequate support to the Water Supply Program.

One obvious solution would be to hire additional chemists for the Agriculture Laboratory since it does have most of the necessary equipment. However, due to the volume of laboratory work that the State Health Department does have, especially when the water and air pollution control programs are considered, it is recommended that chemical facilities be provided in the new State Office Building.

An expenditure of $30,000 to $40,000 probably would be necessary to equip the laboratory to do complete drinking water analysis. Two chemists and a secretary would be needed to process and analyze the recommended number of drinking water samples per year. As mentioned previously, the laboratory also would be used by other programs needing chemical analyses; necessitating additional staff. A portion of the cost of operating the laboratory could be defrayed by charging a set amount for testing the samples.

The chemical analyses should include the constituents listed in the Drinking Water Standards and any other substances which have health significance, such as mercury and pesticides. Samples from drinking water supplies should be collected and analyzed according to the following schedule unless more frequent analyses are made necessary by the presence of harmful levels of certain toxic substances:

1. Surface sources (river) - at least twice per year.
2. Surface sources (lake) - at least once per year.
3. Ground sources and springs - at least once every three years.

This means approximately 180 chemical samples should be analyzed annually in Wyoming.

The chemical data could be processed through the existing computerized system which is being used for the bacteriological results. This will provide the engineering staff a periodic summation indicating potential problems, and will allow them to concentrate immediate remedial action in those areas.

Local Health Departments

The evaluation indicated that a strong local health department can be instrumental in improving the private and semi-public systems within their area of jurisdiction. Since they have a smaller area to cover, the local staff can provide more surveillance and technical assistance. However, there are only two such departments in the entire State. Based on the public health benefits to be gained, the State certainly should be promoting and assisting with the establishment of local health departments. Since many of the counties are sparsely populated, multi-county units would be the most logical. These departments could improve the overall Water Supply Program by:

1. Assisting in maintaining an up-to-date inventory of public, semi-public, and individual water supplies,
2. Assisting with bacteriological and chemical sampling programs,
3. Providing technical assistance to and surveillance of semi-public and private supplies,
4. Assisting with special studies,
5. Assisting with the enforcement of the well construction standards,
6. Providing immediate follow-up assistance on water supply problems.

Of course, a certain amount of technical assistance would be required from the Water Supply Branch's professional staff. However, the increased public health activity realized by the additional local health departments would allow the State personnel to devote more time to technical assistance and special studies.

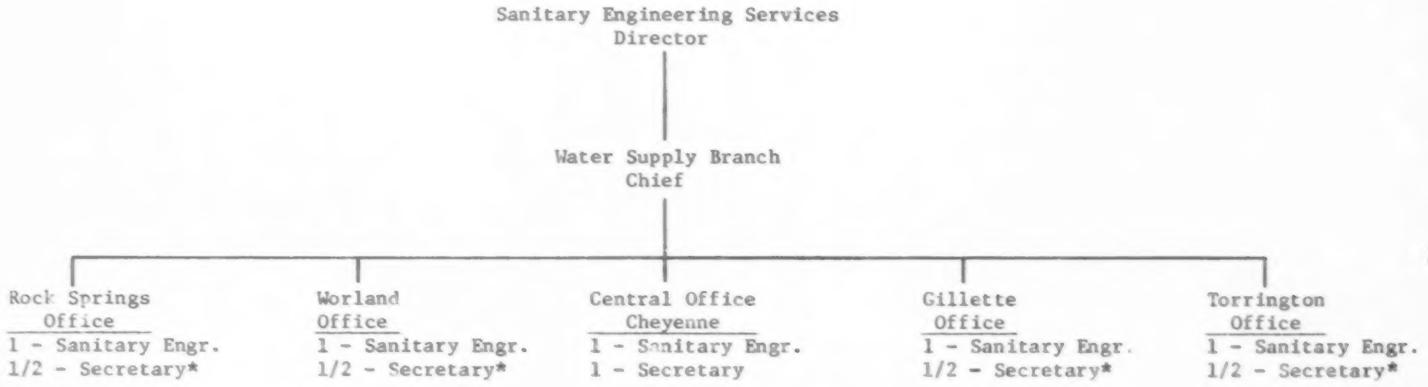
Budget Requirements

A staffing chart for the proposed Water Supply Branch is shown by Figure 9. Personnel costs of the Branch are estimated to be $87,000, based on current State salary levels and including employer paid benefits. Travel, space, equipment and supplies could cost as much as $18,000 additonal. These figures do not include the laboratory staff, since they will not be funded directly by the Water Supply Branch. However, the calculations for the cost of analyzing water samples (discussed below) does include salary adjustments.

The Public Health Laboratory Services examined about 8000 bacteriological samples during 1971 at an estimated cost of $1.50 per sample. Bacteriological analyses for the proposed program could number as high as 12,000 per year which would cost $6000 more than is expended currently.

Figure 9

Proposed Staffing Chart
Water Supply Branch


Sanitary Engineering Services
Director
Water Supply Branch
Chief
Rock Springs Office
1 - Sanitary Engr.
1/2 - Secretary*
Worland Office
1 - Sanitary Engr.
1/2 - Secretary*
Central Office Cheyenne
1 - Sanitary Engr.
1 - Secretary
Gillette Office
1 - Sanitary Engr.
1/2 - Secretary*
Torrington Office
1 - Sanitary Engr.
1/2 - Secretary*

Note: Two of the sanitary engineering positions could be filled with sanitarians.

* Secretaries shared with Environmental Surveillance and Control Services.

Other Related Water Supply Positions

Public Health Laboratory Services
2 - chemists
1 - bacteriologist
1 - secretary

Table 8 summarizes the estimated budget requirements for the proposed Water Supply Branch and compares them with the present level of funding. The proposed budget would more than triple the current expenditures which is an indication of the inadequacy of the present program.

Table 8

Water Supply Program
Budgets

Estimated Budget of Proposed Water Supply Branch

Personnel	
6 professionals and 3 secretaries	$ 87,000
Travel, Space, Equipment and Supplies	18,000
Indirect Laboratory Costs	
12,000 Bacteriological samples	18,000
180 Chemical Samples	27,000
TOTAL	$150,000

Estimated Cost of the Current Water Supply Program

Water Supply Activities	
Sanitary Engineering Services	$ 22,000
Environmental Surveillance and Control Services	10,000
Indirect Laboratory Costs	
8000 Bacteriological Samples	12,000
No Chemical Samples	0
TOTAL	$ 44,000

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THE STATE OF WYOMING

Department of Health and Social Services

Division of Health and Medical Services

STATE OFFICE BUILDING CHEYENNE, WYOMING 82001

January 27, 1971

Mr. Donald P. Dubois
Regional Representative
Environmental Protection Agency
Water Quality Office
9017 Federal Building
Denver, Colorado 80202

Attention Mr. Albert V. Soukup, P.E.
Water Hygiene Representative
Division of Water Hygiene

Dear Mr. Dubois:

This office has reviewed the "Report on Surveillance and Quality of Drinking Water Supplies in New Mexico".

This Department requests that your office make a similar survey and report on our Water Supply Program. We realize there are several deficiencies in our present program. However, an evaluation report from an outside agency may be of help in our efforts to upgrade this program.

Very truly yours,

Arthur E. Williamson, M.S.,P.E.
Director
Sanitary Engineering Services

AEW/cw

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WATER SUPPLY

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WYOMING PUBLIC WATER SUPPLIES
SURFACE SOURCES

Name of Supply	Population Served	Treatment*	Date of Last Engineering Evaluation	Date of Last Chemical Analysis	Bacteriological Summary - 1971			
					Samples Required Per Month	Months		
						Insufficient Samples	Not Sampled	Failed Standards
Basin	1145	C,S,F,D	Before 1967	None	2	0	0	0
Cody	5161	C,S,F,D	10-27-70	None	6	1	0	0
Dayton	396	S,D	11-24-70	None	2	1	0	0
Deaver	112	M,D	11-20-68	None	2	0	0	0
Diamondville	485	KEMMERER'S SYSTEM						
Dixon	72	D	7-15-71	None	2	0	0	2
Encampment	321	None	6-4-70	None	2	0	5	6
Evansville	1000	None	8-14-68	None	2	0	1	2
Fort Washakie	300	C,S,F,D	Before 1967	None	2	0	0	0
Frontier	300	D	Before 1967	None	2	0	3	0
Green River	4196	C,S,F,D	12-8-70	12-8-70	5	1	0	0
Hanna	460	D	6-5-70	None	2	0	0	0
Kaycee	272	S,F,D	9-11-69	None	2	0	0	2
Kemmerer	2292	D	5-23-68	None	3	0	0	3
Lovell	2371	C,S,F,D,W	10-29-70	None	3	0	0	0
Meeteetsee	459	D	9-26-68	None	2	2	1	0
Pinedale	948	D	4-7-71	None	2	0	1	0
Ranchester	208	C,S,F,D	11-24-70	None	2	0	0	0
Rock River	344	D	11-7-67	None	2	0	2	1

WYOMING PUBLIC WATER SUPPLIES
SURFACE SOURCES

Name of Supply	Population Served	Treatment*	Date of Last Engineering Evaluation	Date of Last Chemical Analysis	Bacteriological Summary - 1971			
					Samples Required Per Month	Months		
						Insufficient Samples	Not Sampled	Failed Standards
Rock Springs	11,657	Green River System	12-13-67	12-8-70	15	1	0	0
Saratoga	1,181	C,S,F,D	2-21-68	None	2	0	0	0
Sheridan	10,856	C,S,F,D	9-24-70	12-19-68	12	4	0	0
Sinclair	445	C,S,F,D	6-3-70	None	2	0	0	0
Teton Village	100	None	7-23-70	None	2	0	1	2
Thermopolis	3,063	C,S,F,C,W	9-9-70	None	3	0	0	0
Worland	5,055	C,S,F,D	3-15-68	None	6	3	0	1

* Treatment Key

A = Aeration

C = Coagulation

D = Disinfection

F = Filtration

I = Iron Removal

M = Microstrainer

S = Sedimentation

W = Water Softening

WYOMING PUBLIC WATER SUPPLIES
GROUND WATER SOURCES

Name of Supply	Population Served	Treatment*	Date of Last Engineering Evaluation	Date of Last Chemical Analysis	Bacteriological Summary - 1971			
					Samples Required Per Month	Months		
						Insufficient Samples	Not Sampled	Failed Standards
Acme	100	None	10-9-69	None	2	1	0	0
Afton	1550	None	Before 1967	None	2	0	0	0
Albin	118	None	5-25-70	None	2	0	0	1
Baggs	146	D	10-24-68	None	2	1	1	2
Bairoil	350	None	Before 1967	None	2	0	0	1
Bedford Pipeline Company	225	None	Before 1967	None	2	0	1	0
Big Piney	570	None	4-6-71	None	2	0	0	0
Brownie Water Co.	70	None	Before 1967	None	2	1	11	0
Burns	185	D	11-25-68	None	2	0	1	1
Byron	397	D	4-7-69	None	2	3	0	0
Casper	39,400	D	Before 1967	3-69	50	9	0	0
Chugwater	187	None	6-4-70	None	2	0	0	0
Clearmont	147	None	6-27-69	None	2	0	0	0
Cokeville	440	D	10-14-70	None	2	0	1	1
Cowley	366	D	Before 1967	None	2	0	5	1
Dubois	898	None	6-20-69	None	2	0	0	0
Edgerton	350	NONE	7-17-70	None	2	0	1	0
Elk Mountain	127	A,D	3-11-71	None	2	0	0	1
Fort Laramie	197	None	6-29-70	None	2	0	0	1

WYOMING PUBLIC WATER SUPPLIES
GROUND WATER SOURCES

Name of Supply	Population Served	Treatment*	Date of Last Engineering Evaluation	Date of Last Chemical Analysis	Bacteriological Summary - 1971			
					Samples Required Per Month	Months		
						Insufficient Samples	Not Sampled	Failed Standards
Frannie	139	D	11-20-68	None	2	1	4	0
Gillette	7,194	D	12-4-68	None	8	0	0	0
Glendo	210	None	9-19-68	None	2	0	11	0
Glenrock	1,515	D	7-3-70	None	2	0	0	0
Granger	137	D	Before 1967	None	2	1	0	0
Greybull	1,953	D	8-18-68	None	2	0	1	0
Guernsey	793	D	9-18-68	None	2	0	0	0
Hartville	246	D	Before 1967	None	2	0	0	0
Hudson	381	D	Before 1967	None	2	0	0	1
Hulett	318	None	9-4-70	None	2	0	4	0
Hyattville	120	D	4-3-70	None	2	1	1	0
Jackson	2,101	D	1-20-71	None	2	0	2	0
Jade Hills	50	D	1-7-70	None	2	0	2	0
Jeffrey City	700	None	6-18-69	None	2	1	1	4
Kirby	75	D	12-20-68	None	2	1	0	1
Lance Creek	175	D	10-20-70	None	2	0	1	0
Lingle	446	None	5-26-70	None	2	0	0	1
Lusk	1,445	None	5-27-70	None	2	0	0	0
Lyman	643	D	Before 1967	None	2	1	0	3

WYOMING PUBLIC WATER SUPPLIES
GROUND WATER SOURCES

Name of Supply	Population Served	Treatment *	Date of Last Engineering Evaluation	Date of Last Chemical Analysis	Bacteriological Summary - 1971			
					Samples Required Per Month	Months		
						Insufficient Samples	Not Sampled	Failed Standards
Manderson	117	D	8-7-68	None	2	0	3	0
Manville	92	None	7-31-69	None	2	0	2	0
McFadden	135	None	5-27-70	None	2	2	1	0
Medicine Bow	455	None	Before 1967	None	2	0	1	1
Midvale	40	None	Before 1967	None	2	1	0	0
Mills	1,724	D	11-7-68	None	2	0	0	0
Moorcroft	981	None	7-29-70	None	2	0	3	0
Mountain View	2,000	CASPER	WATER					
New Castle	3,432	None	5-28-70	None	2	0	0	0
North End Water Users	80	None	Before 1967	None	2	1	2	0
North Platte Water District	200	CASPER	WATER					
Orchard Valley	1,449	None	Before 1967	None	2	0	0	1
Osage	350	None	6-30-70	None	2	0	0	0
Paradise Valley	1,500	D	Before 1967	None	2	0	0	0
Pavillion	181	None	7-16-70	None	2	1	1	1
Pine Bluffs	937	None	1-27-71	None	2	10	0	0
Powell	4,807	D	Before 1967	None	6	0	0	0
Red Buttes	80	None	1-7-70	None	2	0	0	0
Reliance	300	None	10-20-71	None	2	0	2	0

WYOMING PUBLIC WATER SUPPLIES
GROUND WATER SOURCES

Name of Supply	Population Served	Treatment*	Date of Last Engineering Evaluation	Date of Last Chemical Analysis	Bacteriological Summary - 1971			
					Samples Required Per Month	Months		
						Insufficient Samples	Not Sampled	Failed Standards
Riverton	7,995	None	6-16-69	None	9	10	0	0
Salt Creek Water District	250	None	Before 1967	None	2	0	0	0
Shirley Basin	300	I,D	2-10-71	None	2	1	0	3
Shoshoni	562	None	6-24-70	None	2	0	0	4
South Superior	197	D	Before 1967	None	2	3	8	1
Spencer Water Co.	80	None	Before 1967	None	2	0	0	0
Sunburst Utility	180	None	4-11-69	None	2	0	0	2
Sundance	1,056	None	7-28-70	None	2	0	1	0
Sunrise	200	D	10-10-67	None	2	0	0	0
Ten Sleep	320	None	8-7-68	None	2	3	0	0
Thayne	195	None	Before 1967	None	2	0	2	1
Torrington	4,237	None	5-26-70	None	5	1	2	0
Upton	987	D	6-30-70	None	2	0	1	1
Wamsutter	139	None	2-20-68	None	2	0	5	2
Wheatland	2,498	D	11-13-70	None	3	0	0	0
Yoder	101	None	9-16-68	None	2	0	0	1

* See Treatment Key on page 104

WYOMING PUBLIC WATER SUPPLIES
DUAL SOURCES - GROUND & SURFACE WATER

Name of Supply	Population Served	Treatment*	Date of Last Engineering Evaluation	Date of Last Chemical Analysis	Bacteriological Summary - 1971			
					Samples Required Per Month	Months		
						Insufficient Samples	Not Sampled	Failed Standards
Buffalo	3,394	D	10-23-70	None	4	8	0	1
Cheyenne	40,914	C,S,F,D	6-19-70	6-19-70	50	8	0	0
Douglas	2,677	C,S,F,D	2-18-69	None	3	0	0	4
Evanston	4,462	C,S,F,D	4-23-70	None	6	2	0	0
Lander	7,125	D	6-18-69	None	8	3	0	1
Laramie	23,143	C,S,F,D	7-12-71	None	26	7	0	0
Midwest	825	F,D	6-24-69	None	2	0	1	0
Rawlins	7,855	D	7-14-71	None	9	1	0	0

* See Treatment Key on page 104

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Appendix C

Public Water Supplies Studied

Public Water Supply	Population Served	Average Daily Demand (MGD)[1]	Source	Treatment[2]
Campbell County				
1. Gillette	7200	0.8	Wells	D
2. Sunburst Utility	180	0.09	Wells	None
3. Wyodak*	110	0.05	Wells	None
Lincoln County				
4. Afton	1550	Unknown	Spring	None
5. Bedford Pipeline Co.	225	Unknown	Spring	None
6. Cokeville	440	0.20	Spring	D
7. Etna Pipeline Co.*	200	Unknown	Spring	None
8. Fairview Pipeline Co.*	120	Unknown	Spring	None
9. Freedom Pipeline Co.*	140	Unknown	Wells	None
10. Green Canyon Pipeline Co.*	30	Unknown	Spring	None
11. Grover*	160	Unknown	Spring	None
12. Kemmerer	2300	1.17	Hamsfork River	D (Treatment plant should be operating in 1972)
13. Osmond Pipeline Co.*	280	Unknown	Spring	None
14. Rainbow Pipeline Co.*	50	Unknown	Spring	None
15. Reeves Pipeline Co.*	30	Unknown	Spring	None
16. Smoot Farmers Pipeline Co.*	85	Unknown	Spring	None
17. Smoot Pipeline Co.*	30	Unknown	Spring	None
18. Thayne	200	Unknown	Spring	None
19. Willow Creek Pipeline Co.*	50	Unknown	Spring	None
Natrona County				
20. Casper	39,400	6.30	Wells	D
21. Evansville	1000	0.23	Elk Horn Creek & Springs	None (Should have chlorinator installed in 1972)
22. Mills	1725	0.50	Wells	D
23. Paradise Valley	1500	0.30	Wells	D

[1] MGD = million gallons per day
[2] D = disinfection

*Do not submit routine samples to the State for bacteriological analysis.

Appendix D

Bacteriological and Chemical Drinking Water Standards

(from 1962 US PHS Drinking Water Standards)

Bacteriological Standards

3.2 *Limits.*—The presence of organisms of the coliform group as indicated by samples examined shall not exceed the following limits:

3.21 When 10 ml standard portions are examined, not more than 10 percent in any month shall show the presence of the coliform group. The presence of the coliform group in three or more 10 ml portions of a standard sample shall not be allowable if this occurs:

(*a*) In two consecutive samples;

(*b*) In more than one sample per month when less than 20 are examined per month; or

(*c*) In more than 5 percent of the samples when 20 or more are examined per month.

When organisms of the coliform group occur in 3 or more of the 10 ml portions of a single standard sample, daily samples from the same sampling point shall be collected promptly and examined until the results obtained from at least two consecutive samples show the water to be of satisfactory quality.

3.23 When the membrane filter technique is used, the arithmetic mean coliform density of all standard samples examined per month shall not exceed one per 100 ml. Coliform colonies per standard sample shall not exceed 3/50 ml, 4/100 ml, 7/200 ml, or 13/500 ml in:

(*a*) Two consecutive samples;

(*b*) More than one standard sample when less than 20 are examined per month; or

(*c*) More than five percent of the standard samples when 20 or more are examined per month.

Chemical Standards

Physical Limits

4.1 *Sampling.*—The frequency and manner of sampling shall be determined by the Reporting Agency and the Certifying Authority. Under normal circumstances samples should be collected one or more times per week from representative points in the distribution system and examined for turbidity, color, threshold odor, and taste.

4.2 *Limits.*—Drinking water should contain no impurity which would cause offense to the sense of sight, taste, or smell. Under general use, the following limits should not be exceeded:

Turbidity	5 units
Color	15 units
Threshold Odor Number	3

Recommended Limits

5.21 The following chemical substances should not be present in a water supply in excess of the listed concentrations where, in the judgment of the Reporting Agency and the Certifying Authority, other more suitable supplies are or can be made available.

Substance	*Concentration in mg/l*
Alkyl Benzene Sulfonate (ABS)	0.5
Arsenic (As)	0.01
Chloride (Cl)	250.
Copper (Cu)	1.
Carbon Chloroform Extract (CCE)	0.2
Cyanide (CN)	0.01
Fluoride (F)	(See 5.23)
Iron (Fe)	0.3
Manganese (Mn)	0.05
Nitrate[1] (NO_3)	45.
Phenols	0.001
Sulfate (SO_4)	250.
Total Dissolved Solids	500.
Zinc (Zn)	5.

---

[1] In areas in which the nitrate content of water is known to be in excess of the listed concentration, the public should be warned of the potential dangers of using the water for infant feeding.

Mandatory Limits

5.22 The presence of the following substances in excess of the concentrations listed shall constitute grounds for rejection of the supply:

Substance	*Concentration in mg/l*
Arsenic (As)	0.05
Barium (Ba)	1.0
Cadmium (Cd)	0.01
Chromium (Hexavalent) (Cr^{+6})	0.05
Cyanide (CN)	0.2
Fluoride (F)	(See 5.23)
Lead (Pb)	0.05
Selenium (Se)	0.01
Silver (Ag)	0.05

5.23 *Fluoride.*—When fluoride is naturally present in drinking water, the concentration should not average more than the appropriate upper limit in Table I. Presence of fluoride in average concentrations greater than two times the optimum values in Table I shall constitute grounds for rejection of the supply.

Where fluoridation (supplementation of fluoride in drinking water) is practiced, the average fluoride concentration shall be kept within the upper and lower control limits in Table I.

TABLE 1.

Annual average of maximum daily air temperatures [1]	Recommended control limits—Fluoride concentrations in mg/l		
	Lower	Optimum	Upper
50.0–53.7	0.9	1.2	1.7
53.8–58.3	0.8	1.1	1.5
58.4–63.8	0.8	1.0	1.3
63.9–70.6	0.7	0.9	1.2
70.7–79.2	0.7	0.8	1.0
79.3–90.5	0.6	0.7	0.8

[1] Based on temperature data obtained for a minimum of five years.

In addition to the sampling required by paragraph 5.1 above, fluoridated and defluoridated supplies shall be sampled with sufficient frequency to determine that the desired fluoride concentration is maintained.

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Appendix E

Survey Forms

FORM APPROVED
BUDGET BUREAU NO. 85-R0136

MUNICIPAL WATER SUPPLY SANITARY SURVEY

SURVEY DATE

1. ☐☐☐☐☐☐☐☐☐☐☐☐ 1 – 12 (for office use only) (DUP ON EVERY CARD)   ☐☐ 13 mo.   ☐☐ day   ☐☐ yr. 18

2. **Name of supply** ____________________

3. **Location** ____________________
post office   common name, if different

4. **Demands, MGD:**

	PRESENT	10-YR. ESTIMATE	UNKNOWN
A. Avg. day	☐☐☐☐☐ 19 ^ 23	☐☐☐☐☐ 24 ^ 28	☐ 30
B. Max. day	☐☐☐☐☐ 31 ^ 35	☐☐☐☐☐ 36 ^ 40	☐ 42
C. Max. month	☐☐☐☐☐ 43 ^ 47	☐☐☐☐☐ 48 ^ 52	☐ 54

5. Water use has been restricted ☐☐ 55 56 times for a total of ☐☐☐ 57 59 days during any one year of the past 5 years.

6. **LABORATORY CONTROL**

A. Bacteriological (Distribution system only)

			UNKNOWN
(1) Min. number samples recommended per month by PHS DWS		☐☐☐ 60 62	
(2) Avg. number/month for last 12 months		☐☐☐ 63 65	☐ 67
(3) Range of least and most monthly samples	from ☐☐☐ 68 70	to ☐☐☐ 71 73	☐ 75

END CARD ONE ☐ 1 80

(4) Number of months the Drinking Water Standards were not met during the last 12 months for:

		UNKNOWN
(a) Quality	☐☐ 13 14	☐ 15
(b) Number of samples	☐☐ 16 17	☐ 18
(c) NONE collected	☐☐ 19 20	☐ 21

(5) Are samples representative of distribution system?	☐ 22 yes	☐ 23 no
(6) Are check samples collected as provided for in the Drinking Water Standards?	☐ 24 yes	☐ 25 no
(7) Are samples requiring check samples reported by telephone?	☐ 26 yes	☐ 27 no
(8) Is the laboratory certified?	☐ 28 yes	☐ 29 no
(a) Within the past 3 years?	☐ 30 yes	☐ 31 no
(b) If "yes" to one or both, by whom was it certified.	☐ 32 State	☐ 33 PHS
(9) Are samples received by lab within 30 hours?	☐ 34 yes	☐ 35 no

ECA-19
(8-70)

B. Chemical (finished water only)

(1) Samples of finished water are analyzed each ☐ 36 month, ☐ 37 year,
☐ 38 2 years, ☐ 39 3 years, ☐ 40 infrequently ☐ 41 never.

(2) Type of analysis: ☐ 42 complete (DWS) ☐ 43 partial.

(3) Date of last chemical analysis ☐☐ 45 mo. ☐☐ day ☐☐ yr. 50

(4) Analyzed by ☐ 51 utility, ☐ 52 state, ☐ 53 PHS, ☐ 54 university, ☐ 55 other.

(5) Tests run for operational control and their frequency are:

Tests			**Frequency**		
	Continuous	Each shift	Daily	Weekly	Less frequently than weekly
Alkalinity	☐ 57	☐	☐	☐	☐ 61
Aluminum	☐ 62	☐	☐	☐	☐ 66
Chloride	☐ 67	☐	☐	☐	☐ 71
Chlorine residual	☐ 72	☐	☐	☐	☐ 76
(END CARD TWO) ☐2 80					
Color	☐ 13	☐	☐	☐	☐ 17
Fluoride	☐ 18	☐	☐	☐	☐ 22
Hardness	☐ 23	☐	☐	☐	☐ 27
Iron	☐ 28	☐	☐	☐	☐ 32
Jar tests	☐ 33	☐	☐	☐	☐ 37
Manganese	☐ 38	☐	☐	☐	☐ 42
pH	☐ 43	☐	☐	☐	☐ 47
Taste & Odor	☐ 48	☐	☐	☐	☐ 52
Turbidity	☐ 53	☐	☐	☐	☐ 57
Zeta potential	☐ 58	☐	☐	☐	☐ 62
Other ______________	☐ 63	☐	☐	☐	☐ 67

C. Radioactivity

(1) Samples are analyzed each ☐ 69 month, ☐ 70 year, ☐ 71 2 years, ☐ 72 3 years,
☐ 73 infrequently ☐ 74 never. *(END CARD 3)* ☐3 80

(2) Date of last radiological analysis ☐☐ 13 mo. ☐☐ day ☐☐ yr 18

(3) Analyzed by ☐ 19 utility, ☐ 20 state, ☐ 21 PHS, ☐ 22 university, ☐ 23 other.
(specify)

7. SANITARY SURVEY

A. Date of most recent survey ☐☐ 24 mo. ☐☐ day ☐☐ yr. 29 or ☐ 30 none

B. Survey made by: ☐ 31 state, ☐ 32 PHS, ☐ 33 local health department, ☐ 34 utility, ☐ 35 consultant.

C. Facilities surveyed: ☐ 36 source, ☐ 37 transmission, ☐ 38 treatment, ☐ 39 storage, ☐ 40 distribution.

8. FACILITIES & OPERATION (describe deficiencies on reverse side)

	YES	NO
A. Are there common walls between finished and lesser quality water?	☐ 41	☐ 42
B. Are there inter-connections to other systems		
(1) of known acceptable quality	☐ 43	☐ 44
(2) of unknown quality		
(a) with protection	☐ 45	☐ 46
(b) without protection	☐ 47	☐ 48
C. Is there a cross-connection control program		
(1) on new construction only	☐ 49	☐ 50
(2) for continuous re-inspection	☐ 51	☐ 52
D. Are finished water reservoirs properly covered?	☐ 53	☐ 54
E. Is there detectable chlorine residual in distant parts of the distribution system?	☐ 55	☐ 56
F. Can the treatment plant be by-passed?	☐ 57	☐ 58
G. Are there satisfactory procedures to:		
(1) prevent personal accidents	☐ 59	☐ 60
(2) prevent chlorine accidents	☐ 61	☐ 62
(3) disinfect all new and/or repaired distribution system mains, valves, fittings, including check samples before being placed in service?	☐ 63	☐ 64
H. Are there areas of low pressure (< 20 psi) in the distribution system under maximum water use?	☐ 65	☐ 66

I. Operating problems most often encountered are: ☐ 67 taste & odor ☐ 68 phenols, ☐ 69 corrosive water, ☐ 70 short filter runs, ☐ 71 other, specify.

8. FACILITIES & OPERATION, continued

J. Chlorination process was interrupted ☐☐ (72 73) times in the last 12 months.

(1) Interruptions were due to: ☐ (74) chlorinator failure, ☐ (75) feedwater pump, ☐ (76) changing cylinders, ☐ (77) power failure, ☐ (78) other, explain.

(END CARD 4) ☐4 (80)

K. Percent of land area within service area where water is available (nearest whole percent) ☐☐☐ (13 15) %.

	YES	NO
L. Were plans and specs. for treatment plant approved by the state?	☐ 16	☐ 17

9. SOURCE, TREATMENT & DISTRIBUTION (describe deficiencies on reverse side)

A. Are the following adequate:

	YES	NO
(1) Source, with respect to the following:		
(a) quantity	☐ 18	☐ 19
(b) bacteriological quality	☐ 20	☐ 21
(c) chemical quality	☐ 22	☐ 23
(d) physical quality	☐ 24	☐ 25
(e) adequate protection	☐ 26	☐ 27
(2) Transmission of raw water	☐ 28	☐ 29
(3) Is the raw water sampled for:		
(a) Bacteriological contamination	☐ 30	☐ 31
(b) Chemical contamination	☐ 32	☐ 33
(4) Treatment, with respect to the folowing:		
(a) aeration	☐ 34	☐ 35
(b) chemical feed, capacity	☐ 36	☐ 37
(c) chemical feed, stand-by equipment	☐ 38	☐ 39
(d) chemical mixing	☐ 40	☐ 41
(e) flocculation	☐ 42	☐ 43

9. SOURCE, TREATMENT & DISTRIBUTION, continued

A. Are the following adequate (continued):

	YES	NO
(4) Treatment, continued:		
(f) settling	☐ 44	☐ 45
(g) recarbonation	☐ 46	☐ 47
(h) filtration	☐ 48	☐ 49
(i) disinfection, capacity	☐ 50	☐ 51
(j) disinfection, stand-by equipment	☐ 52	☐ 53
(k) taste & odor control	☐ 54	☐ 55
(l) fluoridation	☐ 56	☐ 57
(5) Distribution, with respect to the following:		
(a) storage	☐ 58	☐ 59
(b) booster chlorination	☐ 60	☐ 61
(c) high service pumping	☐ 62	☐ 63
(d) booster pumping	☐ 64	☐ 65
(e) pressure	☐ 66	☐ 67
(6) Maintenance	☐ 68	☐ 69
(7) Records for:		
(a) disinfection	☐ 70	☐ 71
(b) filter runs	☐ 72	☐ 73
(c) chemical consumption	☐ 74	☐ 75
(d) operational control tests	☐ 76	☐ 77
(e) bacteriological examinations	☐ 78	☐ 79
(8) Cross-connection control	END CARD 5	5 80
(a) ordinance	☐ 13	☐ 14
(b) program implementation	☐ 15	☐ 16
(c) progress	☐ 17	☐ 18

9. **SOURCE, TREATMENT & DISTRIBUTION, continued**

B. During the past 3 years, raw water quality has ☐19 improved,
☐20 deteriorated, or ☐21 stayed the same.

10. PERSONNEL

A. Water Purification Operator

(1) Highest level of formal education: ☐22 8th grade or less,
☐23 high school, ☐24 technical or trade school, ☐25 university.

(2) Level of training in water treatment: ☐26 college course,
☐27 technical or trade school, ☐28 short school, ☐29 on the job,
☐30 none, ☐31 other, specify ______________________________.

(3) Length of time on this job: ☐☐32 33 years, ☐☐34 35 months.

(4) Number of previous positions as water treatment operator ☐☐36 37

(5) Total years of water purification experience ☐☐38 39

(6) Level of study in sanitary microbiology: ☐40 college course,
☐41 technical or trade school, ☐42 short school, ☐43 on the job,
☐44 none, ☐45 other, specify ______________________________.

(7) Level of study in water chemistry: ☐46 college course, ☐47 technical
or trade school, ☐48 short school, ☐49 on the job, ☐50 none,
☐51 other, specify. ______________________________.

(8) Is the operator a full-time employee? ☐52 yes ☐53 no

(9) Salary range (per year) of operator: ☐54 <$1,999 ☐55 $2,000-4,999
☐56 $5,000-7,499 ☐57 $7,500-9,999 ☐58 $10,000

10. PERSONNEL, continued

A. continued

(10) Is your present staff adequate in:

(a) number ☐ 60 yes ☐ 61 no

(b) quality ☐ 62 yes ☐ 63 no

B. **Operator's major complaint** ________________________________

____

____

C. **Most frequent customer's complaint:** ________________________

____

____

D. **Management's most frequent complaint:** ______________________

____

____

11. FINANCIAL INFORMATION

A. Bonded indebtedness: (water supply)

(1) General obligation bonds $ ☐☐☐☐☐☐☐☐. 66 73 END CARD 6 6 80

(a) statutory limit $ ☐☐☐☐☐☐☐☐. 13 20

(2) Revenue bonds $ ☐☐☐☐☐☐☐☐. 21 28

(a) statutory limit $ ☐☐☐☐☐☐☐☐. 29 36

B. Capital stock, par value $ ☐☐☐☐☐☐☐☐. 37 44

bonds, par value $ ☐☐☐☐☐☐☐☐. 45 52

C. Water funds are ☐ 53 kept separate or ☐ 54 mingled with other funds.

D. Is there an annual payment to the general fund? ☐ 55 yes ☐ 56 no

E. Operation is controlled by: ☐ 57 mayor-council, ☐ 58 mayor-commission, ☐ 59 independent water board, ☐ 60 other, specify. ____________________.

F. Is there active planning for expansion or improvement? ☐ 61 yes ☐ 62 no

(1) Value of planned improvement $ ☐☐☐☐☐☐☐☐. 63 70

(2) Planning by utility ☐ 71 yes ☐ 72 no

(3) Planning by consultants ☐ 73 yes ☐ 74 no END CARD 7 7 80

G. If expansion is planned, it will be carried out within:

	1 YR.	2-5 YRS.	6-10 YRS.
(1) Source	☐ 13	☐	☐ 15
(2) Treatment	☐ 16	☐	☐ 18
(3) Distribution	☐ 19	☐	☐ 21
(4) Other ________________	☐ 22	☐	☐ 24

H. Costs of production:

	CENTS/1,000 GALLONS
(1) Chemicals	☐☐.☐ 26 28
(2) Labor, power, etc.	☐☐.☐ 29 31
(3) Depreciation	☐☐.☐ 32 34
(4) Other, including office, administration, meter reading, collection, etc.	☐☐.☐ 35 37
(5) Total	☐☐.☐ 38 40

11. **FINANCIAL INFORMATION, continued**

I. **Tariff (Residential)**

(1) Connection fee $ ☐☐☐☐ 41 44 .

(2) Sales unit is ☐ 45 per 1,000 gallons or ☐ 46 per 100 cu. ft.

(a) ☐☐☐ 47 cents for the first ☐☐ 50 51 units

(b) ☐☐☐ 52 cents for the next ☐☐ 55 56 units

(c) ☐☐☐ 57 cents for the next ☐☐ 60 61 units

(d) etc. as needed to cover steps.

END CARD 8 8 80

ENVIRONMENTAL PROTECTION AGENCY

Office of Water Programs
Division of Water Hygiene

INDIVIDUAL WATER SUPPLY SURVEY QUESTIONNAIRE

Card 1

NAME ______________ ______________ SAMPLE NO. ☐☐☐☐☐☐ 1

ADDRESS ______________ YEAR ☐☐ 8

Col. ______________

I. THE SOURCE

9 A. Spring ☐1; Well ☐2; Surface Source ☐3; Cistern ☐4

10 B. On-premise ☐1; Off-premise ☐2 (distance: ______________)

11 C. Ground Water from: Sand/Gravel ☐1; Limestone ☐2; Sandstone ☐3; Other Formation ☐4 Specify ______________; Unknown ☐5

12 D. Construction: By Contractor ☐1; Owner/Occupant ☐2; Other ☐3; Unknown ☐4

II. A. SPRING

13 1. Flowing ☐1; Non-Flowing ☐2; Intermittent ☐3

14 2. Encasement: Brick, Block, or Stone ☐1; Reinforced Concrete ☐2; Other ☐3

15 General Condition: Good ☐1; Fair ☐2; Poor ☐3

16 3. Surface Drainage Controlled? Yes ☐1; No ☐2

17 4. Adequate Fencing around spring? Yes ☐1; No ☐2

18 5. Water withdrawn with: Power Pump ☐1; Hand Pump ☐2; Bucket ☐3; Gravity Flow ☐4; Other ☐5

19-20 6. Estimated Minimum Capacity: ☐☐ GPM
Numeric

B. WELL

21 1. Dug ☐1; Driven ☐2; Jetted ☐3; Bored ☐4; Drilled ☐5

2. Dug Well:

22 Acceptable lining to 10' or more? Yes ☐1; No ☐2

23 Acceptable cover? Yes ☐1; No ☐2

24 Masonry or other jointed lining, sealed: Yes ☐1; No ☐2; Unknown ☐3

25 Reconstructed, sealed and filled: Yes ☐1; No ☐2

26 General condition: Good ☐1; Fair ☐2; Poor ☐3

3. Other Types of Walls:

27-28 a. Casing: Diameter: ☐☐ inches, I.D.
Numeric

Col.

29 Steel or Black Iron ☐1; Galvanized Iron or Steel ☐2;
Plastic ☐3; Masonry or Ceramic ☐4; Other ☐5

30 Joints Screwed Coupling ☐1; Joints Welded ☐2; Unknown ☐3

31 Wall thickness, Std. or better? Yes ☐1; No ☐2

b. Depths:

32-34 Ground surface to bottom of well: ☐☐☐ Ft.

35-37 Ground surface to bottom of casing: ☐☐☐ Ft.
Numeric

c. Formation Seal:

38 Cement grout seal from depth of 5 to 10' up to surface ☐1;
10 to 20' up to surface ☐2; Fine sand (natural) seal 10
to 20' up to surface ☐3; Puddled clay seal 5 to 20' up to
surface ☐4; No apparent formation seal between casing and
earth ☐5; Concealed (buried) formation grout seal
reported ☐6; Unknown ☐7

d. Sanitary Well Seal:

39 Water tight cover? Yes ☐1; No ☐2

40 Well exposed to flooding by surface water? Yes ☐1; No ☐2

e. Well Pit

41 Pit around well? Yes ☐1; No ☐2

42 Pit has acceptable cover? Yes ☐1; No ☐2

43 Pit drains to open air? Yes ☐1; No ☐2

44 Pit drains to drain line or sewer? Yes ☐1; No ☐2

45 Possible to flood pit in any way? Yes ☐1; No ☐2

46 Pitless adapter? Yes ☐1; No ☐2

47 Pitless adapter with top of well buried or below ground
level: Yes ☐1; No ☐2

48 f. Well "Filter" or Screen*
Open hole ☐1; Perforated or slotted pipe ☐2; Gravel
Pack ☐3; Sand (well) point or screen of horizontal,
endless slot type ☐4; Other type of screen ☐5

49 g. Age of Well: <2 yrs. ☐1; 2-5 yrs. ☐2; 6-10 yrs. ☐3;
11-20 yrs. ☐4; >20 yrs. ☐5

50 C. PUMP AT SOURCE: Yes ☐1; No ☐2; Bucket ☐3

51 1. Hand pump ☐1; "Shallow well" (Low-Lift) Jet or Centrifugal
pump ☐2; "Deep well"(Hi-Lift) Jet Pump ☐3; Submersible
pump ☐4; Piston Pump ☐5; None ☐6

*Not to be confused with "filter" or strainer attached to suction inlet of pump.

Col.

I. PHYSICAL QUALITY OF WATER

9 1. Colored ☐$_1$; Turbid ☐$_2$; Clear ☐$_3$; Contains sand ☐$_4$

10 2. Taste: Good ☐$_1$; Fair ☐$_2$; Poor* ☐$_3$ ____________________

11 3. Evidence of iron or manganese problem: Yes ☐$_1$; No ☐$_2$

12 4. Water Softener in regular operation: Yes ☐$_1$; No ☐$_2$

13 5. Other water conditioner devices used: Yes ☐$_1$; No ☐$_2$

J. PUBLIC AGENCY INTERESTS**

14 1. Has any public agency inspected this supply at any time within the last two years? Yes ☐$_1$ **________________
________________________________; No ☐$_2$; Unknown ☐$_3$

15 2. Has bacteriological analysis ever been made on the water?
Yes ☐$_1$; Date ________ ,** ____________________________
________________________________; No ☐$_2$; Unknown ☐$_3$

16 a. If "yes", was the water found "safe"? Yes ☐$_1$; No ☐$_2$

17 b. If "no" (under 2a), were corrections recommended?
Yes ☐$_1$; No ☐$_2$

18. c. Were corrections made? Yes ☐$_1$; No ☐$_2$

19 d. After corrections were made, was water retested?
Yes ☐$_1$ **________________________________; No ☐$_2$

20 3. Did the owner, before attempting any construction at the source or before using the source, consult any agency about its suitability? Yes ☐$_1$ **________________
________________________________; No ☐$_2$

21 4. Have any chemical analyses ever been made on the water?
Yes ☐$_1$ Date ________ , ** ____________________________
________________________________; No ☐$_2$; Unknown ☐$_3$

K. USER'S PREFERENCES

22 1. User prefers: Present supply ☐$_1$; Another or improved individual supply ☐$_2$; A public supply ☐$_3$

23-25 ☐☐☐ 2. Reason(s) for Preference: Lower cost ☐$_1$; Better tasting water ☐$_2$; Softer water ☐$_4$; Independence ☐$_8$; More reliable source ☐$_{16}$; Safer ☐$_{32}$; More convenient ☐$_{64}$; Other ☐$_{128}$

L. PRESENT CONSUMPTION

26 1. Number of dwelling units using system ☐

27-30 2. Number of persons using system. Adults ☐☐ ; Children ☐☐

31 3. Is water shortage ever experienced: Yes ☐$_1$ **________________
________________________________; No ☐$_2$

80 CARD NUMBER 2

* Identify if possible

** Identify agency

Col.

52 2. Pump never breaks suction ☐$_1$; Sometimes breaks suction ☐$_2$

53 3. With existing pump, source delivers: <3 GPM ☐$_1$; 3-5 GPM ☐$_2$;
5-10 GPM ☐$_3$; 10-20 GPM ☐$_4$; >20 GPM ☐$_5$

D. SURFACE SOURCE (Stream; Lake)

54 1. Perennial ☐$_1$; Intermittent ☐$_2$

55 2. Upstream: Human activity currently on watershed? Yes ☐$_1$; No ☐$_2$

56 3. Delivery: Flow by pumping ☐$_1$; By gravity ☐$_2$

E. CISTERN

57 1. Catchment Area: Rooftops ☐$_1$; Ground surface paved or covered with impermeable material ☐$_2$

58 2. Ground Area Only: Fenced ☐$_1$; Signs posted ☐$_2$; Unprotected ☐$_3$

59 3. Cistern Construction: Above ground ☐$_1$; Below ground ☐$_2$;

60 Brick or Stone ☐$_1$; Concrete ☐$_2$; Wood ☐$_3$; Steel ☐$_4$

61 General Condition: Good ☐$_1$; Fair ☐$_2$; Poor ☐$_3$

62 4. Device for discarding first water? Yes ☐$_1$; No ☐$_2$

63 5. Cistern Protection: Screened against roderts, birds?
Yes ☐$_1$; No ☐$_2$

64 6. Cleaning: Does cistern have drain which permits cleaning
and flushing to waste? Yes ☐$_1$; No ☐$_2$

65 Does cistern need cleaning now? Yes ☐$_1$; No ☐$_2$

F. WATER TREATMENT

66 1. Sedimentation: Yes ☐$_1$, No ☐$_2$

67 2. Filtration Through: Sand ☐$_1$; Other Medium ☐$_2$

68 3. Chlorination: Automatic ☐$_1$; Manual ☐$_2$

69 4. Softening: Yes ☐$_1$; No ☐$_2$

70 5. Other: Yes ☐$_1$ (Describe)________________________; No ☐$_2$

71 G. STORAGE (All Sources): Yes ☐$_1$; No ☐$_2$

72 1. Pressure tank ☐$_1$

73 2. Other storage: Elevated or Ground Level ☐$_1$; Below ground
level ☐$_2$

74 3. Construction: Steel ☐$_1$; Brick, block or stone ☐$_2$;
Concrete ☐$_3$; Wood ☐$_4$; Plastic ☐$_5$; Other ☐$_6$

75 4. General Condition: Good ☐$_1$; Fair ☐$_2$; Poor ☐$_3$

76 H. DELIVERY

76 1. Water flows to point of use by hand pumping ☐$_1$; Power
pumping ☐$_2$; Gravity ☐$_3$; Hand carry ☐$_4$

80 CARD NUMBER 1; CARD 2 - Dup. 1-8

Appendix F

Wyoming Water Supply Program Evaluation

ADEQUACY OF THE WATER FLUORIDATION CONTROL PROGRAM IN WYOMING

INTRODUCTION

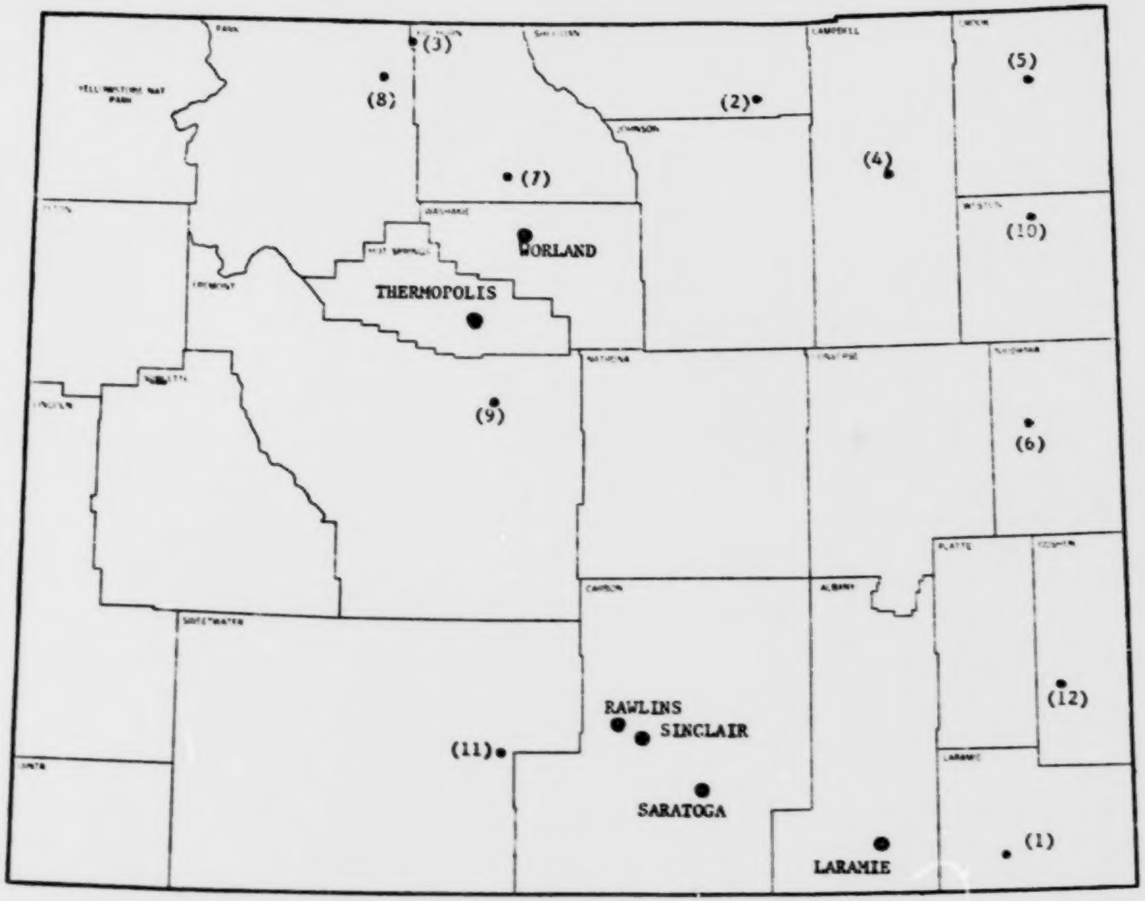
The Wyoming Department of Health and Social Services approves of the addition of fluoride compounds to municipal water supply systems in the State to an optimum level of 1.0 mg/l as an important public health measure for the prevention of tooth decay. The Sanitary Engineering Services, Division of Health and Medical Services of the Department of Health and Social Services is responsible for approval and surveillance of fluoridated water supplies in Wyoming and has established certain standards for fluoride feed equipment, testing procedures, personnel, and safeguards that must be satisfied before an installation is placed in operation. The "Standards Governing Fluoridation of Water" in the State, as adopted August 21, 1959, require the fluoride ion level in the distribution system of a municipal water supply fluoridating shall be maintained at 1.0 mg/l with a maximum of 1.2 mg/l. There is no State law in Wyoming requiring the fluoridation of public water supplies.

Six water supply systems, serving sixteen percent of the population in Wyoming using public water supplies, were fluoridating as of June 1, 1971. Approximately 100 public water supply systems are known to exist in the State and twelve of these systems serving twenty-four percent of the population on public water supplies were using (December 1969) one or more water sources containing natural fluorides of 0.7 mg/l or higher. Two of the communities (Frannie and Upton) use one or more water sources containing natural fluorides greater than the maximum level of 1.2 mg/l but less than two times the recommended optimum level of 1.0 mg/l. Figure 1, Fluoridated Water Supply Systems in Wyoming, locates the six fluoridated water supplies in the State and the twelve communities using one or more water sources containing natural fluorides of 0.7 mg/l or higher. Table I summarizes pertinent information on each fluoridated water supply system.

EVALUATION PROCEDURES

To evaluate the adequacy of the Wyoming water fluoridation control program, the six fluoridated water supply systems in the State operating under the approval of the Department of Health and Social Services were examined with respect to: fluoride content in the distribution system; analytical control of the fluoride level; fluoride feed equipment and facilities; fluoride compound - storage and handling, operator training and interest; and surveillance. A field inspection visit was conducted at each of the six fluoridated water supply systems, survey forms were

Wyoming Water Supply Program Evaluation
FIGURE 1
FLUORIDATED WATER SUPPLY SYSTEMS IN WYOMING


(3)
(8)
(2)
(5)
(4)
(7)
(10)
WORLAND
THERMOPOLIS
(9)
(6)
(12)
RAWLINS
SINCLAIR
(11)
SARATOGA
(1)
LARAMIE

WATER SUPPLY SYSTEMS WITH NATURAL FLUORIDES ($\geqq 0.7$ mg/1)

1 - Cheyenne
2 - Clearmont
3 - Frannie
4 - Gillette
5 - Hulett
6 - Lance Creek
7 - Manderson
8 - Powell
9 - Shoshoni
10 - Upton
11 - Wamsutter
12 - Yoder

● (FLUORIDATED SUPPLIES)

Wyoming Water Supply Program Evaluation

TABLE I
FLUORIDATED WATER SUPPLY SYSTEMS IN WYOMING

Water Supply System	Location (County)	Date of Fldn.	Population Served	Source of Supply	Avg. Flow (MGD)	Fluoride Compound	Type of Feeder	Analysis Method	Test Equipment
Laramie	Albany	5/52	23,170		1.56			H	T-1
Soda-Green Lake				Laramie River		VT	V-1		
Soldier Sprs-Pope Wells				Sprs + 5 Wells		VT	V-2		
City Springs				Springs		VT	V-2		
Rawlins	Carbon	4/70	9,000	Sage Cr + 16 Sprs	1.50	VA	P-1	S	T-3
Saratoga	Carbon	5/59	1,148	N. Platte River	0.35	VS	V-3	1/	1/
Sinclair	Carbon	1/52	450	N. Platte River	1.50	VS	V-5	SS	T-2
Thermopolis	Hot Sprgs	2/54	3,500	Big Horn River	1.50	VS	V-4	S	T-5
Worland	Washakie	6/66	6,000	Big Horn River	1.90	VS	V-4	S	T-4

FLUORIDE COMPOUND:
VA - Fluosilicic Acid
VS - Sodium Silicofluoride
VT - Sodium Fluoride

TYPE OF FEEDER:
V-1 Volumetric - BIF 25-04 Helix Type
V-2 Volumetric - BIF 23-02 Rotating Disk
V-3 Volumetric - W&T BB-588 Roll Type
V-4 Volumetric - W&T A-378 Roll Type
V-5 Volumetric - Infilco E-Chem Feeder
P-1 Diaphram Pump - BIF 1203 Chem-O-Feeder

ANALYSIS METHOD:
H - Hach Visual (Qualitative Only)
S - SPADNS
SS - Scott-Sanchis

TEST EQUIPMENT:
T-1 Color Comparator - Hach FL-1
T-2 Color Comparator - Taylor Water Analyzer
T-3 Photometer - Hach DR-A
T-4 Photometer - Hach DR-EL
T-5 Spectrophotometer - Bausch & Lomb Spectronic 20

1/ No fluoride analysis conducted by operator.

completed,[1] and water samples for fluoride analysis were collected. Officials in charge of the installations were informed of the visit in advance.

The actual level of fluoride in the distribution system is the single most important factor in evaluating the adequacy of a community water fluoridation effort and hence in evaluation of a State Water Fluoridation Control Program which is responsible for approval and surveillance of the installation. However, as distribution samples collected on one particular day may not give a true picture of day-to-day operating conditions at the facility, the following questions grouped in the noted divisions were investigated:

I. Analytical Control of the Fluoride Level
   A. Were the fluoride analyses conducted at the water plant accurate with ± 0.1 mg/1 of the value determined by the Water Supply Programs Division, EPA?
   B. Were finished water samples analyzed daily or more frequently for fluoride content?
   C. Were raw water samples analyzed regularly for fluoride content?
   D. Were laboratory equipment and facilities at the water plant adequate to conduct fluoride analysis according to one of the three Standard Methods?

---

[1] A copy of the questionnaire used in the Wyoming Fluoridation Survey is appended.

E. Was laboratory equipment clean and given responsible care? and,

F. Were complete records kept of the fluoridation operation?

II. Fluoride Feed Equipment and Facilities

A. Were the fluoride feed equipment and facilities adequate to control the fluoride level in the finished water to the desired level?

B. Was positive protection provided against overfeeding, was equipment location and point of fluoride application at the best practical site and was the feed equipment site uncluttered?

C. Was the fluoride feed installation operated continuously for the past twelve months without an interruption of more than one day? and,

D. Were the fluoride feed equipment and facilities maintained satisfactorily?

III. Fluoride Compound - Storage and Handling

A. Was the fluoride chemical compound stored in a safe, protected and orderly manner?

B. Was safety equipment available and were safe procedures followed in handling the fluoride compound? and,

C. Were fluoride compound shipping containers disposed of satisfactorily or re-used only for fluoride chemical storage?

IV. Operator Training and Interest

A. Was the treatment plant operator well-trained to operate the fluoride feed equipment and facilities?

B. Was the individual conducting the fluoride analyses knowledgeable of his test equipment and standard procedures for analysis? and,

C. Was the water plant official interviewed in favor of fluoridation and was he interested in adding fluorides to his water system?

V. Surveillance

A. Were check samples for fluoride analysis submitted to the State on a regular basis? and,

B. Had the water fluoridation installation surveyed been inspected in the past twelve months by personnel from the Sanitary Engineering Services, Division of Health and Medical Services?

SUMMARY OF FINDINGS

Data collected on the water systems fluoridating in the State of Wyoming indicated only two of the six installations evidenced a fluoride content in the distribution system within the 1.0-1.2 mg/l range recommended by the State Department of Health and Social Services. The other four installations were underfeeding, i.e., the fluoride levels in the samples collected from the distribution systems were less than 1.0 mg/l. Table II, Analysis of Samples from Fluoridated Water Supply Systems, tabulates the fluoride analysis results of the water samples collected at each facility surveyed.[2/]

Operating conditions observed at the installations inspected during the time of the survey are summarized as follows:

I. Analytical Control of the Fluoride Level

Practices to analytically test and control the fluoride level in the water system varied considerably at each installation. Only two (33 percent) of the plant operators or chemists reported fluoride analysis within ± 0.1 mg/l of the sample results analyzed by the Water Supply Programs Division, EPA. The operator at one facility was not conducting fluoride analysis and had no test equipment or facilities to analyze water samples for fluoride content. He was reportedly sending two samples per month to the State for analysis; however, State records for 1970 show only eight samples for fluoride analysis were received from that system during the year. Daily finished water fluoride analysis was conducted by the operator or chemist at two (33 percent) of the facilities, and no regular raw water analysis was conducted at any of the six installations.

[2/] Fluoride samples were analyzed using the Electrode Method by the Water Supply Programs Division, Environmental Protection Agency, Washington, D.C.

Wyoming Water Supply Program Evaluation

TABLE II
ANALYSIS OF SAMPLES FROM FLUORIDATED WATER SUPPLY SYSTEMS

(Fluoride, mg/l)

Water Supply System	Date of Sample	Raw Water	Check Samples (Operator)	Check Samples (EPA)	Distribution System	
Laramie					0.70	0.71
Soda - Green Lake	5/24	0.22	1.0	1.42		
Soldier Springs	5/28			1.06		
City Springs	5/28	0.24				
	5/25	0.25	0.5	0.80	0.62	0.64
Saratoga	5/25	0.34	2/	0.21	0.14	0.13
Sinclair	5/25	0.23	0.8	1.12	1.15	1.22
Thermopolis	5/27	0.42	0.76	0.72	0.76	0.74
Worland	5/27	0.46	1.0	0.99	0.99	1.00

1/ Fluoride Feeder Operated [illegible] - May 1 Only.
2/ No Fluoride Analysis Cond[illegible]rator. Samples 2/Mo. Mailed to State Lab.

Adequate laboratory equipment and facilities for fluoride analysis by one of the three Standard Methods were available at four (67 percent) of the facilities visited and care for laboratory equipment was found satisfactory at four (80 percent) of the water treatment plants rated. (Saratoga was not conducting fluoride analysis and was not rated.) One of the operators interviewed was not using Standard Methods for fluoride analysis. Records of the fluoridation operation were acceptable at four (67 percent) of the installations visited.

II. Fluoride Feed Equipment and Facilities

Fluoride feed equipment and facilities were found deficient at four (67 percent) of the six installations surveyed and only three (50 percent) of the feeding arrangements were rated acceptable, i.e., protected against overfeeding, preferred point of feed application, and good housekeeping in the feeder area. Three (50 percent) of the operators reported one or more interruptions in fluoridation of one or more days duration in the past twelve months. Maintenance was found satisfactory at five (83 percent) of the facilities surveyed, however, the plant operators had been alerted to the inspection visit.

III. Fluoride Compound - Storage and Handling

Storage arrangements for the fluoride chemicals fed were found unsatisfactory at two (33 percent) of the six installations visited and the operators at two plants did not have available or were not using safety equipment in handling the fluoride compounds. All the operators interviewed reported satisfactory disposal practices for the empty chemical shipping containers.

IV. Operator Training and Interest

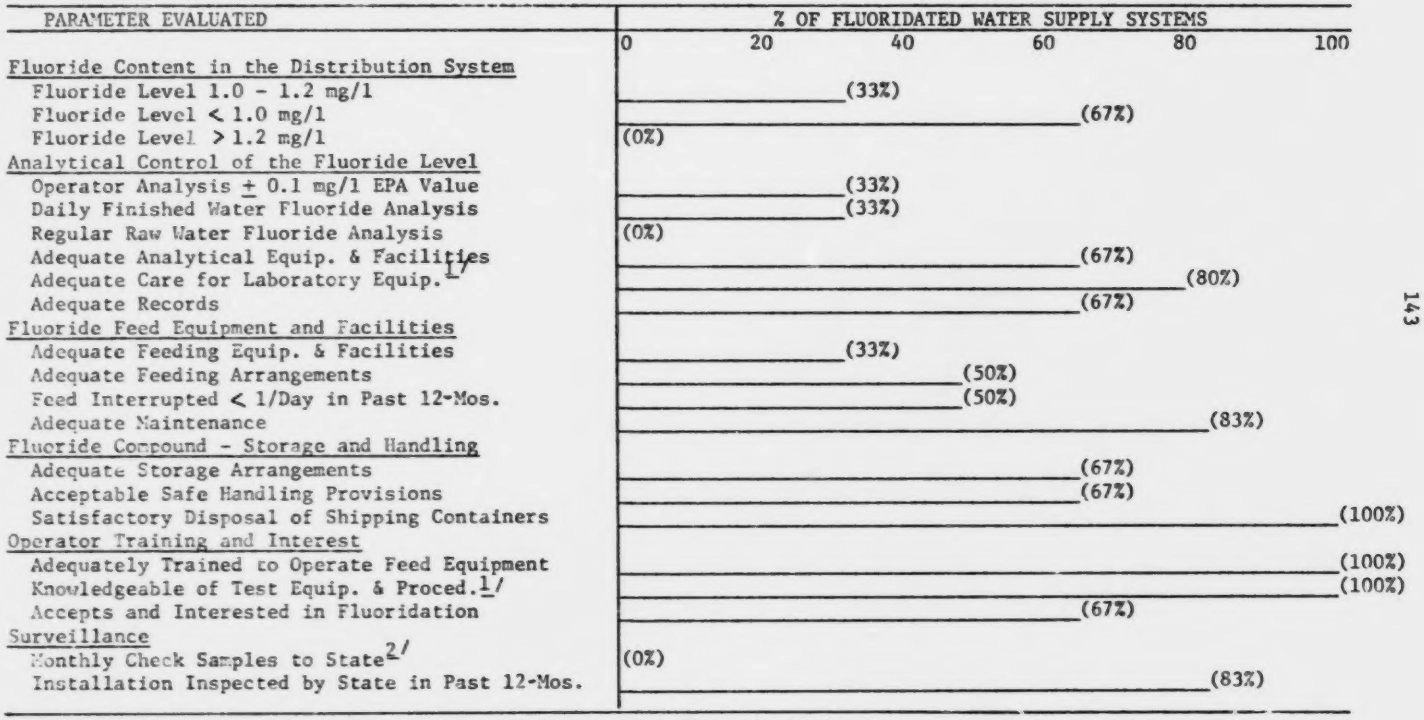
A trained operator with a genuine interest in feeding fluorides is essential to the satisfactory operation of a fluoridation installation. All of the plants visited appeared to be under the control of a plant operator who knew his equipment and how to adjust and control the feeding mechanisms. The operator at one installation was not trained to conduct fluoride analysis. Two (33 percent) of the six water plant officials interviewed did not favor feeding fluorides to public water supply systems. One operator shut down his fluoride feed operation in the summer months (May 1 - September 1) to save on chemicals as "...school was out then and the children would not be needing fluorides."

V. Surveillance

Frequent check samples of fluoride levels in the distribution system and regular inspection visits to the water fluoridation installation by the State water supply surveillance agency must be conducted to assure the facility is operating satisfactorily. The State Department of Health and Social Services' records for 1970 revealed that not one of the six fluoridated water systems submitted a monthly sample for fluoride analysis during 1970. The operators at two facilities submitted only two samples each for the entire year. Five (83 percent) of the six installations, however, had been visited in the past twelve months by a representative of the State Department of Health and Social Services. Inspection visits to the water supply systems fluoridating averaged one visit in seven months.

Figure 2, Operating Conditions at Fluoridated Water Supply Systems in Wyoming, summarizes the operating conditions observed at the installations inspected during the time of the survey. Conditions varied at each facility and Table III, Adequacy of the Fluoridation Installations in Wyoming, summarizes the adequacy of the operating conditions at each facility surveyed.

Wyoming Water Supply Program Evaluation
FIGURE 2
OPERATING CONDITIONS AT FLUORIDATED WATER SUPPLY SYSTEMS IN WYOMING



1/ Five Installations Rated.One Operator did not Conduct Fluoride Analysis
2/ Per 1970 State Department of Health and Social Services' Records

Wyoming Water Supply Program Evaluation

TABLE III

ADEQUACY OF THE FLUORIDATION INSTALLATIONS IN WYOMING

Parameter Evaluated	Laramie	Rawlins	Saratoga	Sinclair	Thermopolis	Worland
Fluoride Content in the Distribution System						
Fluoride Level 1.0 - 1.2 mg/l				X		X
Fluoride Level < 1.0 mg/l	X	X	X		X	
Fluoride Level > 1.2 mg/l						
Analytical Control of the Fluoride Level						
Operator Analysis ± 0.1 mg/l EPA Value			1/		X	X
Daily Finished Water Fluoride Analysis				X	X	
Regular Raw Water Fluoride Analysis						
Adequate Analytical Equipment & Facilities		X		X	X	X
Adequate Care for Laboratory Equipment		X	NA	X	X	X
Adequate Records	X	X		X	X	
Fluoride Feed Equipment and Facilities						
Adequate Feeding Equipment & Facilities		X			X	
Adequate Feeding Arrangements				X	X	X
Feed Interrupted < 1-Day in Past 12-Mos.	X			X	X	
Adequate Maintenance	X	X		X	X	X
Fluoride Compound - Storage and Handling						
Adequate Storage Arrangements		X		X	X	X
Acceptable Safe Handling Provisions		X		X	X	X
Satisfactory Disposal of Shipping Containers	X	X	X	X	X	X
Operator Training and Interest						
Adequately Trained to Operate Feed Equip.	X	X	X	X	X	X
Knowledgeable of Test Equip. & Procedures	X	X	NA	X	X	X
Accepts and Interested in Fluoridation		X	X	X	X	
Surveillance						
Monthly Check Samples to State 2/						
Installation Visited by State in Past 12-Mos.		X	X	X	X	X

X - Satisfactory or applicable for community surveyed

NA - Not applicable

1/ No fluoride analysis conducted by operator

2/ Per 1970 State Department of Health and Social Services' Records

CONCLUSIONS AND RECOMMENDATIONS

1. Six water supply systems serving sixteen percent of the population in Wyoming on public water supplies were fluoridating June 1, 1971. Approximately 100 public water supply systems are known to exist in the State and twelve of these systems serving twenty-four percent of the population on public water supplies were using one or more water sources containing natural fluorides of 0.7 mg/l or higher. Therefore, only 40% of the population in Wyoming on public water supplies have access to water with a dentally significant concentration of fluoride.

   Recommendation:

   The Wyoming Department of Health and Social Services should more actively promote and support fluoridation in Wyoming to make the benefits of fluoridated water available to the population served by the more than eighty or 80 percent of the public water supplies in the State not fluoridated or containing dentally significant concentrations of natural fluorides.

2. Only two (33 percent) of the six fluoridated water supply systems in Wyoming evidenced a fluoride content in the distribution system within the 1.0-1.2 mg/l range recommended by the State Department of Health and Social Services - the other four installations were underfeeding. Two (33 percent) of the facilities visited reported fluoride analyses within ± 0.1 mg/l of the fluoride value determined by the Water Supply Programs Division, EPA, on a duplicate sample. Daily finished water fluoride analysis was conducted by the operator or chemist at only two (33 percent) of the installations and no regular raw water analysis was conducted at any of the six facilities. One of the operators interviewed did not test for fluorides and had no test equipment, and another was not using Standard Methods for fluoride analysis.

   Recommendation:

   The Wyoming Department of Health and Social Services should provide the necessary training and technical assistance to the water plant operators at fluoridation installations to control the fluoride ion level in the distribution system within the recommended range, and to conduct fluoride analysis according to Standard Methods to within ± 0.1 mg/l of the value reported on the State check sample. Daily finished water fluoride analysis, regular raw water fluoride analysis, adequate laboratory equipment and care of equipment, and complete records on the fluoridation operation should be required at all fluoridation installations.

3. Fluoride feed equipment and facilities to control the distribution system fluoride level to within the recommended range were adequate at only two (33 percent) of the installations surveyed and feeding arrangements were judged inadequate at three (50 percent) of the plants visited. Three (50 percent) of the operators reported one or more interruptions in fluoridation of one or more days duration in the past twelve months and maintenance conditions were less than satisfactory at one (17 percent) of the facilities visited even though each operator had been alerted to the visit.

Recommendation:

The Wyoming Department of Health and Social Services should provide design assistance to all communities proposing to install fluoridation facilities, thoroughly review all proposed installations before the operation is approved, and assist the operator as needed during the "start-up" period. Repeated inspection visits to a new installation should be conducted during the first year of operation to assure satisfactory operation of the facility. All interruptions in fluoridation operations should be required to be reported to the Sanitary Engineering Services of the Department of Health and Social Services and investigated by them. A preventative maintenance program should be established for each facility and closely followed for the installation to receive continued approval for operation.

4. Storage arrangements and safety precautions for handling fluoride compounds were judged inadequate at two (33 percent) of the installations surveyed.

   Recommendation:

   The Wyoming Department of Health and Social Services should develop and adopt recommended State regulations governing the storing of fluoride compounds and should enforce the safety precautions on handling of fluoride compounds listed in the State "Standards Governing Fluoridation of Water."

5. A trained operator with a genuine interest in feeding fluorides is essential to the satisfactory operation of a fluoridation installation. The plant operator at one facility was not trained to conduct fluoride analysis. Two (33 percent) of the operators interviewed did not favor feeding fluorides to public water supply systems.

   Recommendation:

   The Wyoming Department of Health and Social Services should expand their short school training program to include a training course in fluoride determinations in water for all operators of fluoridated water supply systems. The benefits of water fluoridation and the importance of maintaining the fluoride level within the recommended range should be stressed. Satisfactory completion of the course should be a mandatory requirement of the plant operator for approval of his installation to feed fluorides.

6. Surveillance of each water fluoridation installation must be on a regular, continual basis to assure the facility is operating satisfactorily. Monthly check samples for fluoride analysis by the State Laboratory were not being submitted regularly by the operators of the fluoridation installations in Wyoming.

   Recommendation:

   The Wyoming Department of Health and Social Services should conduct a minimum of two field inspection visits per year to the water fluoridating installations in the State and visit immediately all plants employing new operating personnel placed in charge of the fluoridation operation. A minimum of one check sample per month should be required by the State from the distribution system of each fluoridated water supply.

DATE: ____________

WYOMING FLUORIDATION SURVEY

Water System:

Population Served: Average Flow:

Date Fluoridation Started:

Source of Supply:

Treatment:

Fluoride Analysis:
Raw Water: Finished Water:

Fluoridation Equipment -

Manufacturer:

Type:

Model:

Location:

Point of application:

Condition of equipment:

Operational problems:

Overfeeding safeguards:

Planned Improvements:

Remarks:

Fluoride Compound -

Chemical: Cost:

Source:

Form of shipment

Storage facilities:

Quantity used:

Safety provisions:

Remarks:

Control of Fluoridation -

Frequency of sampling:
Raw water: Finished water:

Sampling point:

Test method:

Test instrument:

Records:

Interruptions:

Remarks:

Operator Qualifications -

Experience:

Classification:

Training:

Interest:

Remarks:

Surveillance -

Check samples:

Last visit by State:

Availability of technical assistance:

Remarks:

Comments -

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Appendix G

Individual Water Supply Survey

A. Bacteriological Quality

	Campbell County	Lincoln County	Natrona County	Total
Number Wells Studied	31	31	51	113
Number Failing Bact. Limits of DWS*	11 (36%)	11 (36%)	5 (10%)	27 (24%)
Number Springs Studied	0	10	2	12
Number Failing Bact. Limits of DWS	0	6 (60%)	0	6 (50%)
Number of Cisterns Studied	1	0	0	1
Number Failing Bact. Limits of DWS	1 (100%)	0	0	1 (100%)
Number of Surface Supplies Studied	0	1	0	1
Number Failing Bact. Limits of DWS	0	1 (100%)	0	1 (100%)
Total Number Supplies Studied	32	42	53	127
Number Failing Bact. Limits of DWS	12 (38%)	18 (43%)	5 (9%)	35 (28%)

---

* Bacteriological limits of the Drinking Water Standards, i.e. coliform concentration equal 4 colonies or more per 100 ml.

B. Well Construction and Bacteriological Quality

Type of Well	Studied	Number of Wells			
		Failing Bact. Limits of DWS	Having No Formation Seal	Having No Sanitary Seal	Having Poorly Constructed Pit
Campbell County					
Drilled	28	10	26	15	6
Dug	2	1	2	2	0
Driven	1	0	1	0	1
Total	31	11 (36%)	29 (94%)	17 (55%)	7 (23%)
Lincoln County					
Drilled	26	9	23	8	9
Dug	2	1	2	2	1
Driven	3	1	3	2	1
Total	31	11 (36%)	28 (91%)	12 (39%)	11 (36%)
Natrona County					
Drilled	34	1	34	13	28
Dug	13	4	13	10	10
Driven	4	0	4	1	3
Total	51	5 (10%)	51 (100%)	24 (47%)	41 (81%)
Summary					
Drilled	88	20 (23%)	83 (95%)	36 (25%)	43 (21%)
Dug	17	6 (28%)	17 (100%)	14 (82%)	11 (65%)
Driven	8	1 (13%)	8 (100%)	3 (38%)	5 (63%)
Total	113	27 (24%)	108 (96%)	53 (47%)	59 (52%)

C. Construction of Wells Failing Bacteriological Standards

Number	Type of Well Drilled	Dug	Driven	Total
Failing Bacteriological Limits of DWS	20	6	1	27
Having No Formation Seal	19	6	1	26 (97%)
Having No Sanitary Seal	10	5	1	16 (60%)
Having Poorly Constructed Well Pit	7	3	0	11 (41%)

D. Sanitary Protection of Well Sources

Two features which every well should have to prevent contamination from entering are:

(1) A good formation seal in the annular space around the casing or lining.

(2) A sanitary well seal or cover on top of the well.

From the preceding data, it is apparent that few of the wells have either of these important preventive measures. The presence of a well pit also greatly increases the chances for contamination and 52% of the wells studied had such installations. These results show that the well construction in the three counties is inadequate and certainly not in compliance with the State Engineer's Minimum Water Well Construction Standards.

Contrary to popular belief, depth alone will not protect a well from contamination. For example, 41% of the 27 contaminated wells were greater than 100 feet in depth. Two of the wells were over 700 feet deep. This emphasizes the importance of using good well construction practices, including formation and sanitary well seals.

Evidently, as a well becomes older, it will be more susceptible to contamination. Of the 21 contaminated wells, 52% were over 20 years old and 70% were over 11 years old. This could mean that corrosion of the casing is permitting contamination from the surface, or it simply could reflect a better quality workmanship, and/or casing in more recent years.

E. Chemical Water Quality

Type of Supply	County	Number of Supplies Tested	Number Failing: Recommended Limits	Number Failing: Mandatory Limits
Wells				
	Campbell	31	26 (TDS-23; SO_4-12; Fe-7; Mn-3)	4 (F-3; Ba-1)
	Lincoln	31	15 (TDS-10; SO_4-7; Fe 4; Mn-1)	0
	Natrona	51	37 (TDS-33; SO_4-31; Fe 6; Mn-8)	4 (F-3; Cr^{+6}-1)
	Total	113	78 (69%)	8 (7%)
Springs				
	Campbell	0	0	0
	Lincoln	10	2 (TDS-2; SO_4-2)	1 (F)
	Natrona	2	1 (TDS; SO_4)	0
	Total	12	3 (25%)	1 (1%)
Cisterns				
	Campbell	1	1	0
	Lincoln	0		
	Natrona	0		
	Total	1	1 (100%)	0
Surface				
	Campbell	0		
	Lincoln	1	1	
	Natrona	0		
	Total	1	1 (100%)	0
Summary		127	83 (65%)	9 (7%)

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Appendix H

Wyoming Water Supply Legislation

§ **35-19. Inspection of water supply; duties as to streets and public structures generally.** — Said board is authorized and empowered to investigate and ascertain as far as possible, in relation to the pollution of streams and natural waters of this state by artificial causes, or of all water works, and water systems belonging to any city or town, sanitary district, corporation, company or individual, in this state and supplying water for public consumption, which in their judgement [judgment] may be necessary to determine the sanitary and economic effects of such pollution, and to enter in and upon the grounds, buildings and premises, water works, reservoirs, pipe lines, pump houses and everything connected with the collection and distribution of water to the inhabitants of any city or town, to make, institute, and conduct needful experiments pertaining thereto, and shall have power to summon witnesses, administer oaths, and hear evidence relating to such matters, and to make full report to the city, town or sanitary district authorities and also to the proper officers of any privately owned water utility when included in such investigations, of their operations and investigations in writing; and it shall be the duty of all such officers when notified of any unsanitary conditions of streets, alleys, sidewalks, water-works, or other public ways, structures or improvements under their control, to at once take steps to repair, cleanse, abate or destroy the same. (Laws 1901, ch. 55, § 11; C. S. 1910, § 2938; C. S. 1920, § 3601; R. S. 1931, § 103-210; C. S. 1945, § 63-112; Laws 1953, ch. 34, § 1.)

Cross reference. — As to protection of public water supply, see §§ 35-184 to 35-200.

§ **35-20. Power of board in cities and towns.**—It shall be the duty of the state board of health, upon petition of at least twenty taxpayers in any community, to visit as a board or send a competent representative to any incorporated city or town in this state for the purpose of inspecting and thoroughly investigating the sanitary condition of such city or town and the board shall have the power and it shall be the duty of the board to condemn, in any such city or town, any buildings, sewers, water connections, or other things, that in their judgment are in such condition as is likely to produce or cause the spread of epidemic diseases. And the board shall give notice to the mayor and council of such city or town to repair, remove, cleanse or remedy such defect or defects, within ten days, and if the same shall not be done within the time specified in said notice, as directed by the board of health, it shall be the duty of the said board to have same done; and the board is authorized to employ sufficient labor and furnish all necessary materials for the performance of such work, and it shall be the duty of the board, upon the completion of such work, to issue certificates to the person or persons performing such work and furnishing material therefor, and to file a report of the expense incurred in the performance of such work with the clerk of said city or town; and it shall be the duty of the council of such city or town where such work has been performed, to issue warrant or warrants to the proper parties for the payment of all such expense. Said warrant or warrants to be paid by the treasurer of such city or town as other warrants are paid. (Laws 1903, ch. 94, § 2; C. S. 1910, § 2951; C. S. 1920, § 3614; R. S. 1931, § 103-223; C. S. 1945, § 63-113.)

§ 35-23. Rules and regulations.—The state board of health is hereby empowered and directed to make such rules and regulations as shall in its judgment be necessary for the carrying out of the provisions of this act, including rules and regulations providing for the control and treatment of persons isolated or quarantined under the provisions of the two preceding sections [§§ 35-178, 35-179], and such other rules and regulations not in conflict with provisions of this act concerning the control of venereal diseases and concerning the care, treatment and quarantine of persons infected therewith as it may from time to time deem advisable. All such regulations so made shall be of force and binding upon all county and municipal health officers and other persons affected by this act and shall have the force and effect of law; provided, further, that the expense incident to the quarantine and treatment of venereally infected persons in prisons shall be borne by the county in which the person or persons are imprisoned, excepting inmates of state institutions which shall be borne by the state, when evidenced by proper vouchers and receipts approved by the secretary of the state board of health. (Laws 1921, ch. 160, § 26; R. S. 1931, § 103-237; C. S. 1945, § 63-142.)

§ 35-25. Powers and duties. — The division of administration, through the director, or under his direction and supervision, through the other employees of the division, shall have and exercise the following powers and duties:

(1) *Generally.*—To exercise in Wyoming, all the rights and powers and perform all duties hereunder except those expressly vested in the board by sections 4 [§ 35-11] and 5 [§ 35-12] of this act.

(2) *Communicable diseases generally.*—To investigate and control the causes of epidemic, endemic, communicable, occupational and other diseases and afflictions, and physical disabilities resulting therefrom, affecting the public health.

(3) *Enforcement of isolation and quarantine.*—To establish, maintain and enforce isolation and quarantine, and in pursuance thereof, and for such purpose only, to exercise such physical control over property and over the persons of the people within this state as the division may find necessary for the protection of the public health.

(4) *Closing theatres, schools, etc.*—To close theatres, schools and other public places, and to forbid gatherings of people when necessary to protect the public health.

(5) *Abatement of nuisances.*—To abate nuisances when necessary for the protection of the public health.

(6) *Sanitary standards generally.*—To enforce such sanitary standards for the protection of public health as to the quality of water supplied to the public and as to the quality of the effluent of sewerage systems and trade wastes discharged upon the land or into the surface or ground waters of the state, as are or may be established by law, and to advise with municipalities, utilities, institutions, organizations and individuals, concerning the methods or processes believed by him best suited to provide the protection or purification of water and the treatment of sewage and trade wastes to meet such minimum standards.

(7) *Vital statistics, etc.*—To collect, compile, and tabulate reports of marriages, divorces and annulments, births, deaths and morbidity, and to require any person having information with regard to the same to make such reports.

(8) *Dead human bodies.*—To regulate the disposal, transportation, interment and disinterment of the dead.

(9) *Laboratory investigations and examinations.*—To establish, maintain and approve chemical, bacteriological and biological laboratories and to conduct or require such laboratory investigations and examinations as it may deem necessary or proper for the protection of the public health.

(10) *Standard diagnostic tests.*—To make, approve, and require standard diagnostic tests and to prepare, distribute and require the completion of forms of certificates with respect thereto.

WYOMING DEPARTMENT OF HEALTH AND SOCIAL SERVICES

DIVISION OF HEALTH AND MEDICAL SERVICES

State Office Building

Cheyenne, Wyoming 82001

WYOMING POLLUTION LAWS

ARTICLE 2.

PROTECTION OF PUBLIC WATER SUPPLY.

DIVISION 1. GENERALLY

§ 35-184. BOARD OF HEALTH TO SUPERVISE SOURCE OF WATER SUPPLY: ADVISORY COUNCIL TO BE APPOINTED BY GOVERNOR; COMPOSITION: TERM AND COMPENSATION OF MEMBERS; DUTIES GENERALLY. The state department of public health shall have the general oversight and care of all inland waters and of all streams, lakes and ponds used by any city, town or public institution or by any water or ice company in this state as sources of water supply for domestic use, and of all springs, streams, and water courses tributary thereto, with respect to their condition and use as affecting the public health, and any pollution thereof which adversely affects livestock, agricultural crops, wild life, fish or aquatic life is also deemed to affect public health. The state board of health shall also coordinate the activities of agencies of the state concerned with water quality. A council shall be appointed by the governor consisting of the director of the state department of public health, state game and fish commissioner, the state engineer, state commissioner of agriculture and six other members, one of whom shall be a representative of industry and one a representative of municipal government. The term of office for the six appointed members of the council shall be four years but all of those first selected need not be appointed for full terms. The primary duty of the council shall be to advise the state department of public health in developing a comprehensive program for the prevention, control and abatement of new or existing pollution of the waters of the state. It shall be provided with maps, plans and documents suitable for such purposes, and shall keep records of all its transactions relative thereto.

Each of the six appointed members of the council shall receive ten dollars per day for the time actually and necessarily employed and shall be reimbursed for expenses in accordance with section 20-203, Wyoming Compiled Statutes, 1945 (§ 9-13), as amended and re-enacted by Section 1, chapter 89, Session Laws of Wyoming, 1947. (Laws 1923, ch. 92, § 1; R.S. 1931, § 103-244; C.S. 1945, § 63-201; Laws 1951, ch. 42 § 1; 1957, ch. 43, § 1.)

§ 35-185. EXAMINATION OF WATERS; REGULATIONS TO PREVENT POLLUTION. Said state board of health may cause examination of waters to be made to ascertain their purity and fitness for domestic use or their liability to impair the health of the public or persons lawfully using them. It may make rules and regulations to prevent pollution and to secure the sanitary protection of all such waters as are used for domestic purposes. (Laws 1923, ch. 92, § 2; R.S. 1931, § 103-245; C. S. 1945, § 63-202.)

§ 35-186. PUBLICATION OF RULES OR REGULATIONS AS LEGAL NOTICE. The publication for not less than once each week for two successive weeks of an order, rule or regulation made by the state board of health under the provisions of this act (§§ 35-184 to 35-195) in a newspaper of the city or town in which such order, rule or regulation is to take effect, or, if no newspaper is published in such city or town, the posting of at least three copies of such order, rule or regulation in public places in such city or town shall be legal notice to all persons in such city or town and an affidavit of such publication or posting by the person causing such notice to be published or posted, filed and recorded, with a copy of the notice, in the office of the clerk of such city or town shall be admitted as evidence of the time at which, and the place and manner in which, the notice was given. (Laws 1923, ch. 92, § 3; R.S. 1931, § 103-246; C.S. 1945, § 63-203.)

§ 35-187. BOARD OF HEALTH TO CO-OPERATE WITH CITY AND TOWN AUTHORITIES, CORPORATIONS AND PERSONS AS TO WATER, DRAINAGE AND SEWAGE; DEFINITION OF "DRAINAGE" AND "SEWAGE". Said board shall consult with and advise the authorities of cities and towns and persons having or about to have systems of water supply, drainage and sewage as to the most appropriate source of water supply and the best method assuring its purity or as to the best method of disposing of their drainage or sewage with reference to the existing and future needs of other cities, towns or persons which may be affected thereby. It shall also consult with and advise all corporations, companies or persons engaged or intending to engage in any manufacturing or other business whose drainage or sewage may tend to pollute any inland water as to the best method of preventing such pollution, and it may conduct experiments to determine the best methods of the purification or disposal of drainage or sewage. Cities, towns and all other corporations, companies or persons shall submit to said board for its advice and approval their proposed system of water supply or of the disposal of drainage or sewage, and no city, town or persons or company shall proceed to build or install or enlarge or extend any system of water supply, drainage or sewage disposal, without first obtaining the approval of the state board of health. In this section the term "drainage" means rainfall, surface and sub-soil water only, and "sewage" means domestic and industrial filth and waste. (Laws 1923, ch. 92, § 4: R.S. 1931, § 103-247; C.S. 1945, § 63-204.)

§ 35-188. SEWAGE TO BE PURIFIED; EXCEPTION. No sewage, drainage, refuse or polluting matter, of such kind and amount as either, of itself or in connection with other matter, will corrupt, pollute or impair the quality of the water of any spring, pond, lake or stream used as a source of water or ice supply by a city, town or public institution or family or person or water or ice company for domestic use, or render it injurious to health, and no human excrement, shall be discharged into any such stream, spring, lake, pond or upon their banks or into any feeders of such spring, lake, pond or stream unless such sewage, drainage, refuse or polluting water shall have been purified, so as to render it harmless in such a manner and under such conditions and restrictions as the state board of health may direct; provided, that no city or town shall be prohibited or enjoined from discharging its sewage into a river or body of water unless such sewage so pollutes the water thereof as to be dangerous or injurious to public health. (Laws 1923, ch. 92, § 5; R.S. 1931, § 103-248; C.S. 1945, § 63-205.)

§ 35-189. POLLUTION BY INDUSTRIAL PLANTS. No municipal or other public or private corporation and no company or person shall hereafter construct, build, establish or operate any railroad, logging road, logging camp, electric plant, manufacturing or industrial plant of any kind upon or over any watershed of any public water supply system, unless such corporation, company or person shall protect said water supply from pollution by such sanitary precautions as shall be approved by the state board of health, and any such corporation, company or person intending to construct build or establish or operate any railroad, logging road, logging camp, electric plant, manufacturing or industrial plant of any kind upon the watershed of any public water supply system, shall furnish the state board of health with detailed plans and specifications of the sanitary precautions to be taken, which must be approved by said board. (Laws 1923, ch. 92, § 6; R.S. 1931, § 103-249; C.S. 1945, § 63-206.)

§ 35-190. COMPLAINT AS TO POLLUTION; ACTION OF BOARD. Upon complaint to the state board of health or the mayor or health officer of any city or town or the managing board or officer of any public institution or the president of an ice company stating that manure, excrement, garbage, sewage or any other matter which pollutes or tends to pollute the water of any lake, pond, spring, stream or water course used by such city or town, public institution or company as a source of water supply, the said board shall cause a thorough investigation to be made of such alleged nuisance or pollution, and if, in its judgment, the public health so requires, shall by order served upon the party causing or permitting such pollution, prohibit the continuance of such pollution and shall order him to remove any such cause of pollution. (Laws 1923, ch. 92, § 7; R.S. 1931, § 103-250; C.S. 1945, § 63-207.)

§ 35-191. RIGHT OF REPRESENTATIVES OF BOARD TO ENTER BUILDINGS; SEARCH WARRANTS. The agents and servants of said board may enter any building, structure or premises for the purpose of ascertaining whether sources of pollution or danger to the water supply there exist, and whether the rules, regulations and orders aforesaid are obeyed. Search warrants for such purpose may be issued by any court or justice of the peace within the county upon complaint made and probable cause shown. (Laws 1923, ch. 92, § 8; R.S. 1931, § 103-251; C.S. 1945, § 63-208.)

§ 35-192. APPEAL FROM DECISION OF BOARD; COMPLIANCE WITH ORDERS PENDING APPEAL. Whoever is aggrieved by any order of the state board of health passed under the provisions of this act (§§ 35-184 to 35-195) may appeal therefrom to the district court of the county in which such order shall be effective. But such notice as the court shall order shall also be given to the mayor of the city or town or president of the water company or any other person interested in such order. While the appeal is pending the orders of the state board of health shall be complied with unless suspended by the state board of health or by the court. (Laws 1923, ch. 92, § 9; R.S. 1931, § 103-252; C.S. 1945, § 63-209.)

§ 35-193. AUTHORITY OF COURT AS TO ENFORCEMENT. The district court of any county of the state shall have jurisdiction in equity upon the application of the state board of health or any person interested, to enforce its orders or the orders, rules and regulations of said board of health and to restrain the use or occupation of the premises of such portion thereof as said court may specify, on which such material is deposited or kept, or such other cause of pollution exists, until the orders, rules and regulations of said board have been complied with. (Laws 1923, ch. 92, § 10; R.S. 1931, § 103-253; C.S. 1945, § 63-210.)

§ 35-194. REPORT OF BOARD OF HEALTH; NOTICE TO ATTORNEY GENERAL OF POLLUTION OF WATER SUPPLY. The state board of health shall biennially make a report to the legislature, through the governor, of its doings for the preceding period, recommend measures for the prevention of the pollution of such waters and for the removal of polluting substances in order to protect and develop the rights and property of the state and municipalities therein and to protect the public health, and recommend any legislation or plans for systems of main sewers necessary for the preservation of the public health and for the purification and prevention of pollution of the ponds, lakes, springs and inland waters of the state. It shall also give notice to the attorney general of any violation of law relative to the pollution of water supplies and inland waters. (Laws 1923, ch. 92, § 11; R.S. 1931, § 103-254; C.S. 1945, § 63-211.)

§ 35-195. PENALTY. Whoever violates any of the provisions of this act (§§ 35-184 to 35-195) or any rule, regulation or order of the state board of health made under the provisions of act, shall be punished for each offense by a fine of not more than one thousand dollars or by imprisonment for not more than one year or by both such fine and imprisonment. (Laws 1923, ch. 92, § 12; R.S. 1931, § 103-255; C.S. 1945, § 63-212.)

§ 35-196. CONTAMINATION OF STREAMS BY SAWMILLS, MINING OPERATIONS, ETC., PROHIBITED; PENALTY; EXCEPTIONS; SPECIAL PERMITS. Any owner or owners of any sawmill, reduction works, smelter, milling, refining or concentration works, or other manufacturing or industrial works, or any agent, servant or employee thereof, or any person or persons whomsoever, who shall throw or deposit in, or in any way permit to pass into any natural stream or lake within the state, wherein are living fish, any sawdust, chemicals, mill-tailing, or other refuse matter of deleterious substance or poisons of any kind or character whatsoever, that will or may tend to the destruction or driving away from such waters any fish, or kill or destroy any fish therein, or that will or may tend to pollute, contaminate, render impure or unfit for domestic, irrigation, stock or other purposes for which appropriated and used, the waters of any such natural streams or lake, or that will or may tend to obstruct, fill in or otherwise interfere with the flow, channel or condition of such streams, lake or waters, shall be deemed guilty of a misdemeanor and upon conviction thereof shall be fined not less than fifty ($50.00) dollars or more than one hundred ($100.00) dollars or shall be imprisoned in the county jail for not less than thirty days nor more than six months, or by both such fine and imprisonment for each offense; and where any of the foregoing unlawful acts are committed continuously, each of the days upon which committed shall be treated and considered as a separate and distinct offense; provided, that nothing in this or the succeeding section (§ 23-115) shall apply to the slag from smelter furnaces; provided further, that nothing in this section nor in any of the other laws of this state shall prevent the owner or owners of any mill, concentration works, reduction works or tailings pond or basin used in connection therewith, in this state, now or hereafter to be located upon any natural stream, or lake, from operating said mill, concentration works, reduction works or tailings pond or basin used in connection therewith, where the said owner or owners thereof shall build or cause to be built a dam or dams for settling purposes; provided however that before any dam or dams shall be built for any such purposes, the director of the state department of public health, the state game and fish commissioner and the state engineer, acting as a joint committee and each member casting a vote of his department, shall review such plans and according to their findings shall approve or disapprove such plans for preventing any deleterious substances from entering any waters beyond the project area; provided, that whenever a majority of the land owners on any irrigation stream shall petition the state game and fish commissioner to allow saw-dust to be put in any stream that does not reach a main body of water or living stream he shall have the power to grant such permits. (Laws 1931, ch. 83, § 98; R.S. 1931, § 49-200; C.S. 1945, § 47-507; Laws 1957, ch. 82; § 1.)

DIVISION 2. DRINKING WATER STANDARDS

§ 35-197. DEFINITIONS. The following words as used in this act (§§ 35-197 to 35-200), unless a different meaning is required by the context or is specifically prescribed, shall have the following meaning:

(a) "Service connection" shall mean and include any water line or pipe connected to a distribution supply main or pipe for the purpose of conveying water to a building or dwelling.

(b) "Sanitary public water supply" shall mean and include any water supply being distributed by ten or more service connections, such connections being utilized to furnish water for human consumption either in preparing foods or beverages for inhabitants of residences or business establishments.

(c) "United States public health service drinking water standards" shall mean and include the standards prescribed by the United States public health service for the quality of water on interstate carriers, provided further that the section of these standards pertaining to physical and chemical characteristics of water shall not be included in these standards for the purpose of this act. (Laws 1957, ch. 222, § 1.)

§ 35-198. PERIODICAL BACTERIOLOGICAL ANALYSIS OF WATER REQUIRED. It shall be the duty and responsibility of any public or private utility engaged in the development, storage and distribution of a sanitary public water supply to provide for the safety and purity of such supply to every service connection and to collect samples of such water for bacteriological analysis at least once monthly or oftener as required by the state board of health. Such collection shall be made in special containers furnished for this purpose by the state health department division of laboratories and shall be returned to this laboratory for examination. Such examination and reporting of results shall comply with the procedures outlined in the United States public health service drinking water standards. The results of such analysis shall be reported to the owners or persons responsible for the operation of the sanitary public water supply.

When the water from such water supply has been determined by laboratory examination, inspection and report of the state board of health to be unsafe for human consumption as determined by the United States public health service drinking water standards, the owners or persons responsible for the operation of such water supply shall take immediate action to correct sanitary defects, improve operation, provide necessary water treatment, or make any other changes or additions necessary to provide assuredly safe water. (Laws 1957, ch. 222, § 2.)

§ 35-199. NOTICE OF DANGER TO HEALTH. Whenever, in the opinion of the state board of health, investigations indicate that the water from a water supply as described in this act (§§ 35-197 to 35- 200) would endanger the health of the water consumers, the board shall give written notice to the owners or persons responsible for the operation of such sanitary public water supply, specifying the cause of the danger to the health of the water consumers. (Laws 1957, ch. 222, § 3.)

§ 35-200. LIABILITY FOR DAMAGES. Compliance with the requirements of this act (§§ 35-197 to 35- 200)shall in no way release the owners or persons responsible for the operation of a sanitary public water supply from any liability for damage to persons or property caused by or resulting from the installation, operation or maintenance of a sanitary public water supply. (Laws 1957, ch. 222, § 4.)

§ 35-462. DEPOSITING OR PLACING REFUSE MATTER, DEAD ANIMALS, GARBAGE, ETC. INTO RIVERS, DITCHES, RAILROAD RIGHT OF WAYS, HIGHWAYS, ETC., PROHIBITED; DECLARED NUISANCE; EXCEPTION AS TO MUNICIPAL GARBAGE DISPOSAL SYSTEMS. The depositing, placing, or causing to be placed or put, the carcass of any dead animal or the offal or refuse matter from any slaughter house, butcher shop, meat market, packing house, fish house, hog pen, stable, or any spoiled meats, spoiled fish, or any animal or vegetable matter in a putrid or decayed condition or which is liable to become putrid, decayed or offensive, or the contents of a privy vault, or any refuse or garbage, or any offensive matter or substance whatever upon or into any river, creek, bay, pond, canal, ditch, lake, stream, railroad right-of-way, public or private ground, or in any other and different locality, building, or establishment in this state so located that the said substance shall directly or indirectly cause or threaten to cause the pollution or impairment of the purity and usefulness of the waters of any spring, reservoir, stream, irrigation ditch, lake or water supply whether surface or subterranean, which are used wholly or partly as a source of public or domestic water supply, or where the same may become a source of annoyance to any person, or within one-half mile of any inhabited dwelling, or within one-half mile of any public roadway, by any person or persons, association of persons, company or corporation, incorporated city, incorporated or unincorporated town in the State of Wyoming, or the knowingly permitting of such acts by the owner, tenant, or occupant of said places, upon, into, or on said places, or the permitting of said offensive substances or other offensive substances to remain thereon or therein, shall be unlawful and is hereby declared to constitute a nuisance detrimental to the public health and general welfare of the citizens of Wyoming, provided that no present and (or) future operation of any existing municipal garbage disposal system or any extension of or changes therein, which involves substantially daily burning, and no present and (or) future operation of any now existing municipal sewage disposal system or facilities or any extension of or changes therein, shall be considered as within the scope of the foregoing provisions of this act (§§ 35-462, 35-463) or as a violation thereof but further provided that the foregoing exception concerning any existing municipal garbage disposal system whether or not such involves substantially daily burning, shall not be applicable to or except from the scope of this act, any such system which has been commended since prior construction in the close vicinity thereof, of occupied residential buildings or occupied business properties, ten or more in number (Laws 1945, ch. 131, § 1; C. S. 1945, § 9-705.)

§ 35-463. PENALTY FOR VIOLATION OF PRECEDING SECTION. Any person violating the provisions of this act (§§ 35-462, 35-463) shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine of not less than fifty dollars nor more than two hundred dollars or shall be imprisoned in the county jail not to exceed six months, or shall be punishable by both such fine and imprisonment. (Laws 1945, ch. 131, § 2; C.S. 1945, § 9-706.)

§ 35-464. THROWING SAWDUST INTO STREAMS. If any person or persons who may own, run or have charge of any sawmill in this state shall throw or permit the sawdust therefrom to be thrown or placed in any manner into any river, stream, creek, bay, pond, lake, canal, ditch or other water course in this state, such person or persons shall be liable to a like penalty as is provided in section one of this act. (Laws 1884, ch. 62, § 4; R. S. 1887, § 1023; R. S. 1899, § 5116; C. S. 1910, § 5967; C. S. 1920, § 7256; R. S. 1931, § 32-711; C. S. 1945, § 9-707.)

§ 35-465. FAILURE OF OWNER TO REMOVE OR BURY DEAD ANIMAL. It shall be the duty of the owner, or person having charge of an animal which may die in this state, to remove the carcass to a distance of not less than half a mile from the nearest human habitation, or to bury it with not less than two feet of soil over it; and every person failing to so remove or bury such carcass, for more than forty-eight hours, shall upon conviction, be fined in a sum not exceeding one hundred dollars. And should such animal be the property or in charge of some person passing through this state, then any peace officer may (without warrant) detain the owner or person in charge of such animal, or of the flock or herd from which it died, as soon as such owner or person shall have shown an intention not to so bury or remove said carcass, by removing from it, or removing such flock or herd from it a distance of half a mile or more, a reasonable time, not to exceed two days until a warrant can issue upon an information duly sworn to. And the brand upon such animal may be given in proof of the ownership of the same. (Laws 1879, ch. 29, § 3; R. S. 1887, § 1005; R. S. 1899, § 5111; C. S. 1910, § 5962; C. S. 1920, § 7251; R. S. 1931, § 32-706; C. S. 1945, § 9-704.)

§ 35-466. PLACING GARBAGE, RUBBISH, GRASS, ETC., ON HIGHWAYS PROHIBITED. It shall be unlawful for any person to throw, dump, place or dispose of in any manner upon any highway or road right-of-way, any garbage, trash, litter, rubbish, debris, carcass or parts of dead animals, wrecked or abandoned vehicles, equipment and machinery or parts thereof, tin cans, scrap iron, glass, bottles, or any substance which would be likely to injure any person, animal or vehicle, or which would in any way detract from the appearance of the land within any highway or road right-of-way. (Laws 1957, ch. 90, § 1.)

CREATION OF "THE DEPARTMENT OF HEALTH AND SOCIAL SERVICES"

SECTION 1. Effective July 1, 1969, there shall be created a department within the executive branch entitled "The Department of Health and Social Services", hereinafter referred to as "The Department".

ABOLITION OF BOARD OF DEPARTMENT OF HEALTH; BOARD AND DEPARTMENT OF WELFARE; AND BOARD AND DIVISION OF VOCATION REHABILITATION OF THE DEPARTMENT OF EDUCATION; TRANSFER OF DUTIES AND POWERS

SECTION 2. The Department is the successor to the currently existing Board and Department of Health, Board and Department of Welfare, and the Board and Division of Vocational Rehabilitation of the Department of Education, which are hereby abolished as of July 1, 1969.

All powers, duties and regulatory authority vested by law in the Board and Department of Health, the Board and Department of Welfare, and the Board and Division of Vocational Rehabilitation of the Department of Education, are transferred to the Department as of July 1, 1969, and the performance of such acts or functions by the Department shall have the same effect as if done by the former departments, boards or division as referred to or designated by law, contract or other document, such reference or designation shall apply to the Department. All rules, regulations and orders of the former departments, boards and division lawfully adopted prior to July 1, 1969, and not inconsistent with the intent of this act, or other state and federal laws, shall continue to be effective until revised, amended, repealed or nullified pursuant to law.

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Appendix I

Wyoming Water Supply Standards

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OFFICIAL STANDARDS
ADOPTED
By

DIVISION OF HEALTH AND MEDICAL SERVICES
WYOMING DEPARTMENT OF HEALTH AND SOCIAL SERVICES
CHEYENNE

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INTRODUCTION

Application of the following standards and recommendations are essential in providing a safe, potable quality of water.

The water may be clear, cool, and free from objectionable tastes and odors, but may contain bacteria which render it dangerous for human consumption. To be satisfactory, water should be free at all times from any organism capable of causing disease and should not contain excessive amounts of dissolved minerals.

The use of contaminated or polluted water supplies has been the cause of many cases of typhoid fever, paratyphoid, dysentery, and cholera. Other waterborne disease organisms causing infectious hepatitis and gastroenteritis have been correlated with water contaminated by intestinal discharges of patients or carriers.

The State Department of Public Health, Division of Laboratories, will perform bacteriological analyses on domestic water supplies. However, it should be emphasized that no unprotected water supply can be considered bacteriologically safe, nor can any one safe sample from any supply be considered assurance of a continuously safe supply unless a thorough sanitary survey of the supply, together with subsequent safe samples, support this position. In this regard, no untreated surface supply should ever be considered bacteriologically safe.

STATE OF WYOMING
DEPARTMENT OF PUBLIC HEALTH
Cheyenne

MINIMUM STANDARDS FOR PRIVATE OR SEMI-PUBLIC WATER SUPPLIES

Section 1. Authority. Pursuant to authority vested in the State Board of Health through Wyoming Statutes 1945, Sections 63-114; 63-142; -(35-23) and 63-202, the following standards are hereby promulgated. (35-166) (35-185)

These standards apply to any person, partnership, corporation or company who in the conduct of their business provide water, with or without cost or renumeration, to the public, or use such water in the preparation of food, cleaning of utensils or equipment which directly or indirectly contact special individuals, groups, or the public at large.

The standards set forth herein are not obligatory for private homes or individuals.

Section 2. Definitions

a. Aquifer. Ground-water reservoir.

b. Artesian Water. Subsurface water in a confining aquifer under hydrostatic pressure greater than atmospheric.

c. Bacteriological Quality. Concentration and frequency of concentration of the coliform bacteria.

d. Chemical. Mineral content, etc.

e. Contamination. Presence of pollution.

f. Ground Water. Water occurring below the water table.

g. Physical Characteristics. Relate to the quality of water for domestic use, color or turbidity, temperature, taste and odor.

h. Pollution. Presence in water of any foreign substances (organic, inorganic, radiological, biological) which tend to lower its quality or impairs its usefulness.

i. Spring. Ground water that flows upon the land surface or into a body of surface water.

j. Surface Water. Direct runoff and dry weather stream flow.

k. Turbidity. Presence of suspended material such as clay, silt, etc.

l. Water Table. Upper surface of zone of saturation not confined by impermeable material.

Section 3. Water Source and Protection

a. Wells

(1) Location of Wells

(a) The well shall be located on a site which has good surface drainage at a higher elevation than any source of contamination or pollution.

(b) Minimum distances between wells, suction lines, or buried water reservoirs, and various sources of contamination.

TABLE I

Contamination Sources	Well, Suction Line, or Reservoir (Distance in Feet)
Cast Iron Sewer	20
Other Sewer	50
Septic Tank	50
Disposal Field	100
Seepage Pit	100
Cesspool	100

(c) A well shall not be located within the foundation walls of a dwelling.

(d) All suction lines shall be located at the same distance from sources of contamination as outlined in Table I above.

(e) No well or suction pipe shall be located in a pit, except where a properly installed submersible pump is employed.

(2) Construction of Wells

(a) Casing. Every well shall be provided with an outside water-tight protective casing that extends at least twelve (12) inches above ground level to at least ten (10) feet below ground surface except that a well casing sealed in a water-tight manner at the top and served by a submersible pump may terminate below ground level in a properly constructed pit. No casing shall be used as a suction or eduction pipe.

(b) Platform and Pumproom Floor. The well shall be provided with a reinforced concrete platform or pumproom floor at least four (4) feet square and sloped to drain away from the well.

(c) Well Seal. All openings at the top of the well shall be securely sealed against the entrance of contamination and waste water.

(d) Pumps. The pumps shall be designed and secured to the well casing to prevent the entrance of contamination into the well.

(e) All pumping equipment shall be located above ground level except where a submersible pump is employed. The pumping equipment may be protected against freezing by one of the following methods:

Method 1. Insulated Pumphouse. The pumping equipment may be located in an insulated pumphouse which is supplied with an auxiliary source of heat during the winter months.

Method 2. Underground Discharge. The well may be provided with an underground discharge of the type which does not require the use of a "frost" pit.

b. Springs

(1) Location of Spring

A spring which is to be developed as a source for drinking or domestic water shall be located in compliance with Table I, Page 2, in respect to sources of contamination.

(2) Construction of Spring

(a) A spring shall have a water-tight and durable casing and cover.

(b) The water supply shall be obtained from one or more discharge pipes that pass through the encasing wall or curbing.

(c) A spring shall be protected against flooding from above by an intercepting or diversion ditch to carry away the surface drainage.

(d) Provisions shall be made for protecting the water entering the enclosing structure of springs at points less than ten (10) feet below ground surface.

c. Operation of Water Supplies

(1) The source and distribution system shall be properly disinfected after construction or repairs.

(2) The source, equipment and all appurtenances shall be maintained in a sanitary condition.

d. Water Storage Reservoirs

(1) Location of Reservoirs

(a) Underground reservoirs shall be located on a well-drained site at least two (2) feet above the highest known flood level and at a sufficient distance from all sources of contamination as set forth in Table I.

(b) No reservoir shall be located so that the bottom is below the water table.

(2) Construction of Reservoirs

(a) A reservoir shall be constructed of appropriately durable materials and shall be water-tight.

(b) The access manhole shall have raised edges, an overlapping cover, and method of locking the cover in place.

(c) All overflows, vents and other openings shall be hooded and properly screened.

(d) There shall be no direct connection between a reservoir and any sewer or storm drain.

(3) Disinfection of Reservoirs

All reservoirs shall be disinfected subsequent to construction or repair. This shall be accomplished in accordance with the procedure outlined and recommended by the Wyoming Department of Public Health, Division of Environmental Sanitation.

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CHAPTER I

GENERAL STANDARDS GOVERNING MOBILE HOME PARKS, TRAVEL TRAILERS, TRUCK CAMPERS AND OVERNIGHT CAMPING

Section 1. Authority. 35-18; 35-25 (6) and (15), Wyoming Compiled Statutes, 1957.

Section 2. To Whom Standards Apply. The following Standards shall apply to any community, incorporated or unincorporated; county; city and county; institution, person, firm or corporation operating, maintaining, or offering for public or private use within the State of Wyoming any tract or parcel of land for use either free of charge or by payment of a fee for the parking of a mobile home, travel trailer or truck camper as defined in the definition of these Standards when the number of such units exceeds two and are inhabited. For the interpretation or enforcement of these Standards the following items are mandatory.

Section 3. Definitions.

a. Mobile Home. A vehicle used or so constructed as to permit its being used as a conveyance upon the public streets or highways and duly licensable as such, constructed in such a manner as will permit year-round occupancy thereof as a dwelling. Such unit overall length shall be twenty-nine (29) feet or more.

b. Travel Trailer. A vehicle used and so constructed as to permit its being used as a conveyance upon the public streets or highways and duly licensable as such, constructed in such a manner as will permit occupancy thereof as a seasonal dwelling. Such unit shall be less than twenty-nine (29) feet overall length.

c. Truck Camper. Any vehicle used or so constructed as to permit its being used as a conveyance upon the public streets or highways and duly licensable as such, constructed in such a manner that temporary facilities for dwelling or sleeping are provided upon the frame or bed of such vehicle. Such facilities may be either permanently or temporarily attached.

d. Dependent Mobile Home. A mobile home which does not have a flush toilet, bath or shower.

e. Dependent Travel Trailer or Camper. A travel trailer or camper which does not have a flush toilet, bath or shower.

f. Independent Mobile Home. A mobile home which has both flush toilet and a bath or shower.

g. Independent Travel Trailer or Truck Camper. A travel trailer or truck camper which has both a flush toilet and shower either self-contained or not.

h. Tent Trailer. A vehicle less than twenty (20) feet in length with an expandable enclosure of canvas, fabric, or metal constructed in such a manner that temporary facilities for sleeping or dwelling are provided.

i. Tent. A shelter made of flexible material erected directly on the ground.

j. Mobile Home Park. An area occupied by three or more unit spaces of the predesignated type which are being utilized for dwelling or sleeping purposes.

k. Unit Space. A plot of ground within a mobile home park designated for the accommodation of one unit of a predesignated type.

l. Sanitary Station. A facility provided for the emptying of self-contained tanks in travel trailers or other mobile vehicles.

m. Person shall mean person, firm, corporation, or association.

n. Approved shall mean acceptable to the health authority following his determination as to conformance with these standards and good public health practice.

o. Service Building. A building housing separate toilet and bathing facilities for men and women, having laundry facilities, and a service sink.

p. Service Sink. A sink used for clean-up purposes within the service building.

q. State Health Officer. As used herein shall mean the Administrator of the Division of Health and Medical Services, Wyoming Department of Health and Social Services, or his authorized representative.

Section 4. Plans and Specifications. No corporation, municipality, association, institution, firm or person shall construct a mobile home park as defined in these Standards without prior written approval of the State Health Officer. Two copies of the complete plans and specifications for all phases of the construction and operation of the proposed mobile home park shall be submitted to the Division of Health and Medical Services, Sanitary Engineering Services, Wyoming Department of Health and Social Services, Cheyenne, Wyoming, at least thirty (30) days prior to the proposed date for bid letting or the start of construction. The plan shall show the following:

a. The area and dimensions of the Mobile Home Park site.

b. The number, location and size of all unit spaces, plus a designation as to specific usage.

c. The location and width of roadways and walkways.

d. The location of the service building (or buildings) and any other proposed structures (storage buildings, garbage and trash stations, etc.).

e. The location of water and sewer lines.

f. The location of storm drains and/or catch basins.

g. Where a private or semi-public water supply is utilized, complete plans and specifications of the well, housing, plumbing, and water system along with all specifications shall be submitted.

h. When private sewage disposal facilities are utilized, their location shall be given and all pertinent details of construction and final disposal (tank size, lagoon size, tile field, etc.).

i. A floor plan of the service building shall be prepared showing the number and location of toilets, urinal(s), shower(s), or bath(s), lavatories, laundry facilities, service sinks, doors, windows, and all other pertinent information.

j. Additional plans shall be required including details of a typical individual water and sewer connection.

k. Complete plans and specifications of the sanitary station and its location.

l. Plans and specifications of all other improvements constructed or to be constructed within the trailer court.

m. Complete plans and specifications of kitchen waste disposal method when not connected to mobile home park sewage system.

Section 5. Permits. It shall be unlawful for any person to maintain or operate any mobile home park within the State of Wyoming unless he holds a valid permit issued annually on a calendar year basis by the State Health Officer. All applications for permits shall be made to the State Health Officer who shall issue the permit upon compliance by the applicant with provisions of these Standards. No permit shall be transferable. Every person issued a permit shall give notice in writing to the State Health Officer within twenty-four (24) hours after having sold, transferred, given away or otherwise disposed of interest in, or control of, any mobile home park. Such notice shall include the name and address of the person succeeding to the ownership or control of such mobile home park.

Section 6. Inspection of Mobile Home Parks At least once every six (6) months the Health Officer shall inspect every mobile home park located within the State of Wyoming In case the Health Officer discovers a violation of any item of sanitation, he shall make a second inspection after the lapse of such time as he deems necessary for the defect to be remedied. If, upon subsequent inspection of any mobile home court, the State Health Officer finds that conditions or practices exist which have previously been brought to the attention of the owner or operator, he shall then give notice in writing to the person to whom the permit was issued. Any violation of the same item on a third inspection shall necessitate immediate suspension of the permit. The State Health Officer shall advise the owner or operator by registered mail of the conditions existing, and the Health Officer shall re-inspect such mobile home park at the end of an additional thirty (30)-day period. If he finds that such conditions or practices have not been corrected, he shall give notice in writing to the person to whom the permit is issued that a hearing shall be held.

Section 7. General Provisions For All Mobile Home Parks.

a. Mobile home parks shall be well drained.

b. The mobile home park shall be adequately lighted at night.

c. Each mobile home unit shall have its boundaries clearly defined and contain a minimum of 2500 square feet. (See Chapter II, Section 2. a. for exception.)

d. Each unit shall abut on a driveway not less than twenty (20) feet in width which shall have unobstructed access to a public street or highway.

e. Each sewer service connection shall utilize a riser pipe of at least a 4 inch diameter which terminates at least 4 inches above the ground surface. The tubing or piping connecting the mobile home drain outlet and the sewer riser pipe shall be noncollapsible, semirigid, and of 3 inch diameter. A reducer from 4 to 3 inches shall connect the bell end of the 4 inch riser pipe with the 3 inch semirigid tubing or piping. All materials used for sewer connections shall be corrosion resistant, nonabsorbent and durable, with a smooth surface. Other types of sewer connections, such as those which utilize a screw type connection, are acceptable if they are watertight, airtight, and otherwise equivalent to the recommended connection.

When the sewer connection is not in use, the bell of the riser pipe shall be capped with an airtight cap or plug.

f. Mobile homes, travel trailers, truck campers, tenting units or tents shall be located on each unit space so there is a minimum of:

(1) Fifteen (15) feet clearance between all mobile homes, travel trailers, truck campers, tenting units or tents.

(2) Ten (10) feet between each mobile home, travel trailer, truck camper, tenting unit or tent and any adjoining property line.

(3) Twenty-five (25) feet between the mobile home, travel trailer, truck camper, tenting unit or tent and the curb line of any public street or highway.

(4) Fifteen (15) feet between the unit and any building or structure.

(5) Each unit space shall have a minimum width of twenty-five (25) feet.

(6) Provisions shall be made for adequate all-weather walkways to each unit.

g. No greater number of occupied mobile homes, travel trailers, truck campers, tenting units or tents shall be allowed than there are unit spaces available therefor.

NOTE: This is not to infer that a special parking area may not be provided for unoccupied mobile homes, travel trailers or truck campers. When such is the case, the unit space requirement is waived.

h. Sufficient area shall be provided for the parking of at least one motor vehicle for each unit space.

NOTE: A separate area should be provided for recreational purposes. This area should be in a location not subject to traffic hazards and should provide approximately one hundred (100) square feet of open area for each unit space.

i. A sanitary station shall be provided within every mobile home park that provides units or facilities for travel trailers, truck campers or tent trailers.

NOTE: Restroom facilities shall be provided in all mobile home parks for emergency use.

Section 8. Water Supply.

a. An adequate and safe supply of water under pressure shall be supplied to each unit. (See exception in Chapter II, Section 3.)

b. The source, quality, quantity, distribution system, volume and method of storage of water shall be approved by the Wyoming Department of Health and Social Services, Division of Health and Medical Services. All water and sewer lines shall have a minimum horizontal separation of ten (10) feet.

c. Samples for bacteriological examination shall be submitted regularly and routinely at the rate of not less than four (4) per year, while the mobile home park is occupied, when other than a municipal supply is utilized.

Section 9. Sewage Disposal. The method of liquid waste disposal shall be by connection to a municipal disposal system or shall be in accordance with the Minimum Standards for Private Sewage Disposal Systems and approved by the State Health Officer.

Section 10. Refuse Disposal.

a. The storage, collection and disposal of refuse shall be in such a manner as to avoid a health hazard, odor nuisance, and be approved by the State Health Officer.

b. Refuse containers shall be provided in adequate numbers within one hundred (100) feet of each unit space.

c. Garbage shall be collected and disposed of a minimum of once weekly and more often if needed.

Section 11. Insect and Rodent Control.

a. Every mobile home park shall be kept free of rubbish and maintained in a sanitary condition at all times.

b. Harborage for rodents and insects shall be eliminated.

c. Breeding places for flies and mosquitoes shall be eliminated or controlled.

Section 12. Electricity.

a. All electrical wiring in the mobile home park shall be in strict compliance with the State Electrical Code governing such installation.

Section 13. Fire Protection.

a. All new mobile home parks shall have all plans and specifications reviewed and approved by the office of the State Fire Marshal.

b. All recommendations of the State Fire Marshal's office shall be strictly adhered to. Lack of compliance with State Fire Regulations shall be deemed sufficient cause for revocation of permit.

Section 14. Miscellaneous.

a. Skirting of coaches is permissible but such skirting shall not permanently attach the coach to the ground, provide a harborage for rodents, create a fire hazard, or be utilized as a general storage area.

b. The wheels of any mobile home or travel trailer shall not be removed except temporarily for repair.

Section 15. Registration of Occupants. Every mobile home park owner or operator shall maintain a register containing a record of all mobile homes, travel trailers, truck campers, tent trailers and tenters using the mobile home park.

CHAPTER II

SPECIAL STANDARDS GOVERNING OVERNIGHT FACILITIES FOR MOBILE HOMES, TRUCK CAMPERS AND TENTING UNITS

Section 1. General. The following variances from the general provisions in Chapter I are made for facilities catering to the overnight camper utilizing such units as truck campers, travel trailers, tents and tent trailers.

Section 2. Unit Space.

a. Each unit space provided for a truck camper, travel trailer or tenting unit shall contain a minimum of one thousand (1,000) square feet.

b. Each unit space provided for tenting units shall be provided with a table and provisions for fire building.

c. Provisions shall be made for disposal of kitchen or sink waste water at each unit space in a manner approved by the Wyoming Department of Health and Social Services, Division of Health and Medical Services. Where a pipe connection is provided it shall not exceed two (2) inches in diameter.

d. No unit space serving a dependent travel trailer, truck camper or tenting unit shall be located further than 300 feet radially from the service building. Unit spaces greater than this distance must be designated for and used by self-contained units.

Section 3. Water Supply. A water supply approved by the Wyoming Department of Health and Social Services, Division of Health and Medical Services, providing a central watering point is the minimum requirement for installations designed entirely to provide the overnight type of facility.

> NOTE: The operator will find that it is advisable to provide a water hook-up at a number of unit spaces.

Section 4. Service Building. Each mobile home park which permits the parking of dependent mobile homes, dependent travel trailers, dependent truck campers or tenting units, as defined in the definitions, shall provide the following:

A service building which shall provide toilet and bath facilities for each sex; the number of units required as given in the following table.

Number of parking sites	Toilets		Urinals	Lavatories		Showers		Other fixtures
	Men	Women	Men	Men	Women	Men	Women	
1-15 ...	1	1	1	1	1	1	1	1 slop sink
16-30 ...	1	2	1	2	2	1	1	
31-45 ...	2	2	1	3	3	1	1	
46-60 ...	2	3	2	3	3	2	2	
61-80 ...	3	4	2	4	4	2	2	

NOTE: For determination of the needed plumbing fixtures, all unit spaces not served by a sewer connection and within 300 feet radially of the service building will be considered as available for parking dependent travel trailers, truck campers and tenting units.

a. Each water closet shall be in a private compartment.

b. A sound retardant wall shall separate the toilet facilities for each sex when provided in a single building.

c. Each bath or shower shall be in a private compartment.

d. A slop sink shall be provided for disposal of liquid wastes and for clean up and maintenance of the service building.

e. The service building shall be of permanent construction and be provided with adequate light, heat and ventilation.

f. Interior construction shall be of cleanable, moisture resistant materials.

g. All windows, doors or other openings shall be screened.

h. All plumbing shall conform to the National Plumbing Code, ASA, A40.8-1955 or a later addition thereof, or the local plumbing code, whichever is the more rigorous.

i. An adequate volume of hot and cold running water shall be provided at all times in the service building.

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CHAPTER I

MINIMUM STANDARDS GOVERNING DUDE RANCHES

Section 1. Authority. Sections 35-12; 35-18; 35-274, Wyoming Statutes, 1957.

These standards have been prepared as a guide to Dude Ranch operators and as an aid to health authorities in providing adequate environmental sanitation standards in all areas where dude ranching activities occur. The great increase in the utilization of recreational areas necessitates a forward approach to the special problems and conditions associated with such activities. The intent of these standards is not discriminatory or retalitory, nor is it designed to prohibit or restrict Dude Ranch operations generally.

The intent of the standards is to assist the individuals engaged in this activity to provide both for themselves and their guests the maximum health protection and reduction of legal liability relating to environmental health conditions.

Section 2. Definitions. The following definitions shall apply in the interpretation and the enforcement of this standards.

Dude Ranch. A ranch, working or seasonal, accepting tourists generally or select clientele.

Health Officer. The term "health officer" shall mean the Director of Health of the State of Wyoming or his authorized representative.

Person. The word "person" shall mean person, firm, corporation, or association.

Facility. The word "facility" shall mean the central structure in which guests are housed or fed.

Department. The word "department" shall mean the Wyoming State Department of Public Health.

Section 3. Plans, Specifications and/or Letter of Intent to Operate or Assume Operation of a Dude Ranch. Plans, specifications and/or letter of intent to operate or assume operation of a Dude Ranch shall be submitted to the Health Officer at least two (2) weeks prior to bid letting or construction start, and all recommendations of the Wyoming State Department of Public Health shall be complied with prior to operation. Note: This is not to be construed as to mean plans are to be submitted yearly.

a. Plans and Specifications.

(1) Complete plans and specifications for new construction, all additions to and remodeling, of all Dude Ranches shall be submitted.

(2) Codes or Standards to be followed in all construction are:

(a) National Plumbing Code
(b) National Building Code
(c) National Electrical Code
(d) Standards for Private Sewage Disposal Systems
(e) Minimum Standards for Private or Semi-Public Water Supplies.
(f) Minimum Standards Governing Food Service Establishments
(g) Minimum Standards Governing Swimming Pools

Section 4. Permits. It shall be unlawful for any person to operate a Dude Ranch in the State of Wyoming who does not possess a permit from the Health Officer. The permit shall at all times be available within the facility. Only persons who comply with the requirements of this standard shall be entitled to receive and retain such a permit.

The permit is issued on a yearly basis, the expiration date is May 31 of each year. The responsibility for applying for new permits, prior to the expiration date of a permit, is the direct responsibility of the person owning or operating such activity.

The permit may be temporarily suspended by the Health Officer upon repeated violations by the holder of the permit of any of the requirements of this standard or revoked after an opportunity for a hearing by the Health Officer following serious or repeated violation, and the Dude Ranch closed.

Hearings. Hearings provided for in this section shall be conducted by the Wyoming State Department of Public Health at a time and place designated by the Department and in the manner set forth in the State Board of Health policy.

Reinstatement of Permit. Any Dude Ranch, the permit of which has been suspended, may at any time make application for the reinstatement of the permit.

After the receipt of a satisfactory application, accompanied by a statement signed by the applicant to the effect that the violated provision or provisions of this standard have been conformed with, the Health Officer shall make a reinspection, and thereafter as many additional reinspections as he may deem necessary to assure himself that the applicant is again complying with the requirements, and in case the findings indicate compliance, shall reinstate the permit.

From and after twelve (12) months from the date on which this standard takes effect no Dude Ranch shall operate within the State of Wyoming unless it conforms with the requirements of this standard.

Note: There is no charge for the permit. The permit is a method of control only.

Section 5. Inspection of Dude Ranches. At least once yearly the Health Officer shall inspect every Dude Ranch located within the State of Wyoming. In case the Health Officer discovers a violation of an item of sanitation he shall make a second inspection after a lapse of such time as he deems necessary to correct the defect. A third inspection shall be used in determining compliance with the requirements of this standard. Any violation of the same item of the standard on such third inspection shall call for immediate suspension of the permit and procedures shall then be instituted to hold a hearing.

One copy of the inspection report shall be left with the person responsible for the operation and the original of the report shall be filed with the records of the State Department of Public Health.

The person responsible for the Dude Ranch shall upon request of the Health Officer permit access to all phases of the activity and shall provide such pertinent information to the Health Officer as the Health Officer may deem necessary for the protection of public health.

Section 6. Sanitation Requirements for Dude Ranches. Compliance with Items a (1) (2) & (4), and b (1) & (2) of the following items of sanitation is essential before a permit is issued to any Dude Ranch. All other items shall be complied with within a reasonable time but not later than one (1) year after a permit has been issued.

a. Water Supply.

(1) The water supply of all Dude Ranches shall comply with the Minimum Standards for Private or Semi-Public Water Supplies.

(2) During all periods of operation a minimum of one (1) sample shall be submitted to the Wyoming Department of Public Health per month.

(3) The results of such bacteriological examination of the water supply shall be retained by the operator for not less than three (3) years.

(4) Upon bacteriological or structural determination that the water supply is not approved immediate, corrective measures shall be instituted by the responsible person and such measures shall first be approved by the Wyoming State Department of Public Health.

b. Sewage Disposal.

(1) All sewage disposal shall be in accordance with the Minimum Standards for Private Sewage Disposal Systems.

(2) The sewage disposal systems shall not pollute any stream

(3) Approval for all new systems or changes to present systems shall be approved by the Wyoming State Department of Public Health.

c. Food Service.

(1) All food service at Dude Ranches shall be in accordance with the Minimum Standards Governing Food Service Establishments.

Exception: A special permit exclusively for food service is not required.

d. Swimming Pools (where applicable)

(1) All swimming pools located upon the premises and an integral part of the activity shall comply with the Minimum Standards Governing Swimming Pools.

e. Insect and Rodent Control.

(1) All practical methods for the eradication or reduction of insects and rodents shall be used.

f. Sleeping or Housing Facilities.

(1) Rooms shall be cleaned daily.

(2) Protection of mattresses and pillows shall be provided.

(3) Multi-use utensils used in the rooms shall receive daily approved cleaning and sanitization.

g. Disposal of Solid Wastes.

(1) All solid wastes such as trash, garbage, paper, and all other litter shall be disposed of in a manner which is approved by the State Department of Public Health.

Section 7. Disease Control. No person who is affected with any disease in a communicable form or has been proven to be a carrier of such disease shall work on any Dude Ranch, and no Dude Ranch shall knowingly employ any such person or any person suspected of being affected with any disease in a communicable form or of being a carrier of such disease. If the person responsible for the Dude Ranch operation suspects that any employee has contracted any disease in a communicable form or has become a carrier of such disease he shall require medical proof from the employee that such health conditions do not exist. A placard containing this section shall be posted in the facility.

Section 8. Procedure When Infection Suspected. When suspicion arises as to the possibility of transmission of infection from any Dude Ranch the Health Officer is authorized to require any or all of the following measures: (a) the immediate exclusion of any employee from the Dude Ranch; (b) the immediate closing of the Dude Ranch concerned until no further danger of disease outbreak exists, in the opinion of the Health Officer; (c) adequate medical examinations of all employees and of their associates, with such laboratory examinations as may be indicated.

STATE OF WYOMING
DEPARTMENT OF PUBLIC HEALTH

STANDARDS GOVERNING FLUORIDATION OF WATER

When fluoridation of a municipal water supply is being contemplated by a community it should be borne in mind that the equipment, testing procedures, personnel, and safeguard should meet certain standards. As an initial step toward a program of fluoridation the following information should be submitted to the State Department of Public Health.

1. A recent chemical analysis of the municipal water supply. This should include determinations for fluorides, sulfates, alkalinity, hardness, acidity, iron, aluminum, phosphates, color and turbidity. If an analysis is not available this Department will make such an analysis.

2. The name and qualifications of the person or persons who will be in charge of the application of the fluoride compound and be responsible for making the fluoride tests. He must be capable of learning to make tests for fluoride according to the procedures outlined in "Standard Methods of Water Analysis" and to make calculations relating to the amount of chemical to be added when adjustments are necessary.

3. Some evidence of popular demand. This may be by popular vote, straw vote, resolutions by civic groups, etc. This is recommended but not required.

When it has been determined that fluoridation of a municipal water supply is in the best interest of the people of that community, fluoride compounds may be added to the water in accordance with the following standards:

a. The city council must first take official action authorizing the application of fluoride compounds to the city water supply and make such action a matter of official record. A copy of this shall be forwarded to the State Department of Public Health.

b. Plans and specifications for the equipment to be used in applying the fluoride must be submitted to the State Department of Public Health for approval. The location and housing facilities for chemical storage, and a description of the laboratory equipment and protective devices shall be included.

c. Specifications for the chemical compound to be used shall be submitted to the Department for approval.

d. The name, qualifications and training record of the person in direct charge of the fluoridation process shall be submitted to the Department for consideration and approval.

f. The fluoride ion level to be maintained shall be 1.0 part per million with a maximum of 1.2 parts per million. Feeding apparatus shall have an accuracy tolerance of not more than 5 per cent and shall be of a type which has been successfully used elsewhere and for which parts and service are readily available.

g. Special precautions shall be taken to protect the operators from inhaling fluoride dust when charging the hoppers of the feeders. Dry feeders shall be equipped with dust collectors consisting of bag filters operating under positive air pressure and vented to the outside air. Each operator who handles fluoride shall be equipped with his individual respirator of a type approved by the U. S. Bureau of Mines for protection against toxic dust and with dust proof gloves. Respiratory equipment and replacement units shall be stored in approved containers when not in use.

h. While the equipment is in operation, the responsible operator shall:

    (1) Maintain the feeding apparatus in good working order.

    (2) Collect and make fluoride determinations by approved methods on:

        (a) Daily samples of unfluoridated water.

        (b) Daily samples of fluoridated water at the plant.

    (3) Keep a daily record of amounts of fluoride applied and results of fluoride determinations. A copy of this record shall be furnished to the Department monthly or oftener if requested.

    (4) Submit a sample of water to the Department for analysis as often as requested by the Department.

    (5) Use an approved dust respirator and dust proof gloves while exposed to the dust of the dry fluoride compound.

Approved and Adopted: August 21, 1959

Appendix J

Report of a Survey of the
Wyoming State Health and Social Services
Division of Laboratories
at State Office Building
Cheyenne, Wyoming 82001
on September 16-17, 1971

by

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Microbiologist
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Office of Water Programs
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The equipment and procedures employed in the bacteriological analyses of water by this laboratory conformed with the provisions of Standard Methods for the Examination of Water and Wastewater (13th edition-1971) and with the provisions of the Public Health Service Drinking Water Standards, except for the items marked with a cross "X" on the accompanying form EPA - 103 (Rev-3-71). Items marked with a "U" could not be determined at the time of the survey. Items marked "O" do not apply to the procedures programmed in this laboratory. Specific deviations are described with appropriate remedial action for compliance in the following recommendations:

Recommendations

Items 2 and 3 Collection procedures and Sample bottles

It is recommended that the present narrow mouth, 90-ml capacity bottles be replaced with 4 oz. (120 ml) wide-mouth bottles to assure that not less than 100-ml volumes are collected and an ample air space remains for adequate mixing before examination. Wide-mouth bottles are recommended in order to reduce the chance of accidental contamination during sampling and to facilitate sample handling by laboratory personnel.

Item 4 Transportation and storage

It is suggested that the sample sheet, Figure 1, accompanying each sample bottle include information on the exact location of the sampling point, residual chlorine, and directions for collection and shipment of samples to the laboratory.

Directions should emphasize the need to coordinate collection and shipment of samples with existing postal service schedules and to avoid collection and shipment of samples toward the end of the week and prior to holidays.

Item 5 Records of laboratory examinations

A review of the records indicate that unsatisfactory samples are reported and the initial follow-up action is prompt; however, only one resample is requested. It is recommended that daily samples from the same sampling point be collected and examined until the results obtained from at least two consecutive samples indicate that contamination is no longer present.

Items 10 and 30 Hot-air sterilizing oven

The temperature control on the hot-air sterilizing oven is pre-set; however, the actual temperature obtained is not verified. An accurate thermometer should be used to verify that sterilization temperature is reached and maintained (170° to 180° for two hours).

Item 12 Thermometers

The accuracy of all laboratory thermometers used to measure temperatures in water samples, water baths, hot-air sterilizing ovens, and autoclaves should be verified. Verification of accuracy should be made at selected temperatures within the minimum and maximum range of intended use by comparison with readings on a thermometer certified by the National Bureau of Standards or one of equivalent accuracy. Thermometers should be rechecked periodically to ensure their accuracy.

Item 24 Pipets containers

Metal containers are recommended for sterilization and storage of pipets and petri dishes and may be constructed of stainless steel or other non-corrosive, heat resistant metal. Stainless steel containers resist heat and last longer than those constructed of aluminum; however, aluminum containers are satisfactory. Copper containers should not be used for either pipets or petri dishes because particles of oxidized copper may be introduced into samples or media.

Item 31 Laboratory water quality

All distilled water used for bacteriological tests should be free of both inorganic and organic substances either toxic or nutritive, which may influence survival or growth of bacteria. Many factors can influence the quality of distilled water: (1) design of the distillation equipment, (2) source of raw water;

(3) storage chamber for reserve supply; (4) temperature of stored supply; and (5) duration of storage before use. These factors may contribute varying degrees of contaminants such as metal ions, ammonium hydroxide, hydrochloric acid, chlorine from the source water, and carbon dioxide from the air. In order to assure the quality, it is recommended that a distilled water suitability test be conducted periodically.

Item 48 Completed test

The confirmed test can yield positive reactions in the absence of the coliform group (false-positive test). Therefore, it is necessary to establish the validity of the confirmed test by comparison with the completed test. The number of comparative procedures for establishing the confirmed test for use in water quality examination by comparison with the completed test depends on the individual location. Approximately 20 tests each three months should be sufficient when good agreement is secured. The number should be increased if results from the confirmed and completed tests differ. The completed test is the reference standard.

Item 50 Reference material

Since it is required that all equipment and procedures employed in the bacteriological analyses of water conform with the provisions of Standard Methods for the Examination of Water and Wastewater, it is essential that the laboratory be supplied with a copy of the current edition (13th edition - 1971) for reference use.

Item 60 Physical facilities

The physical facilities with reference to bench space and lighting are inadequate for processing and examining samples during peak work periods. The space problem is compounded by the fact that some clinical diagnostic examinations are conducted in the same area.

It is recommended that the water laboratory be separated from the diagnostic laboratory as a safety precaution when sufficient space becomes available. Better lighting of the present work area is needed so that a light intensity of at lease 50 foot-candles is supplied to all working surfaces.

Remarks

Sample bottles

The plastic "whirl-pak" bags presently used to collect private water samples do appear adequate since the addition of sodium thiosulfate is not necessary;

however, consideration should be given to changing to wide-mouth sample bottles. Even though detailed, graphic instructions are furnished describing proper collection procedures, the probability of accidental contamination by inexperienced sample collectors is much greater using plastic bags.

In order to expedite transferring cultures from the presumptive to the confirmed medium, it is suggested that single service hardwood applicators, 1/12 to 1/8 inch in diameter and at least 1 inch longer than the test tube be used. These should be sterilized by dry heat and stored in glass or non-toxic metal containers.

Personnel Approved

Mrs. Hildegarde McCoy, Bacteriologist, is approved for the application of the total and fecal coliform multiple-tube procedure to the bacteriological examination of drinking waters and stream water quality measurements.

Conclusions

The procedures and equipment in use at the time of this survey complied in general with the provisions of Standard Methods for the Examination of Water and Wastewater (13th edition-1971) and the Public Health Service Drinking Water Standards, and with correction of listed deviations, it is recommended that the results be accepted for the bacterial examination of waters under interstate regulations.

Harry D. Nash

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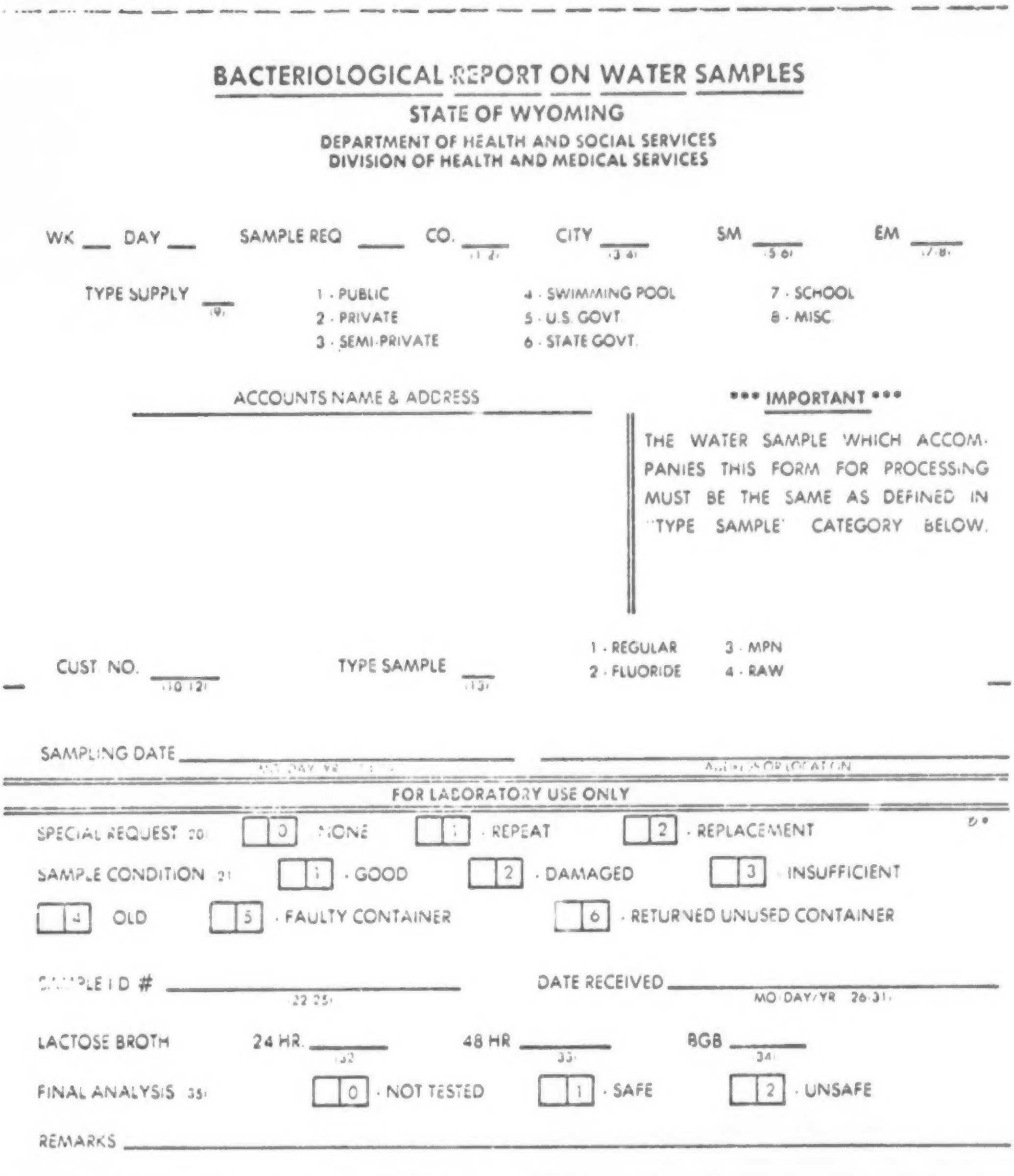

BACTERIOLOGICAL REPORT ON WATER SAMPLES

STATE OF WYOMING

DEPARTMENT OF HEALTH AND SOCIAL SERVICES
DIVISION OF HEALTH AND MEDICAL SERVICES

WK __ DAY __ SAMPLE REQ ___ CO. ___ (1 2) CITY ___ (3 4) SM ___ (5 6) EM ___ (7 8)

TYPE SUPPLY __ (9)

1 - PUBLIC
2 - PRIVATE
3 - SEMI-PRIVATE
4 - SWIMMING POOL
5 - U.S. GOVT.
6 - STATE GOVT.
7 - SCHOOL
8 - MISC.

ACCOUNTS NAME & ADDRESS

*** **IMPORTANT** ***

THE WATER SAMPLE WHICH ACCOMPANIES THIS FORM FOR PROCESSING MUST BE THE SAME AS DEFINED IN "TYPE SAMPLE" CATEGORY BELOW.

CUST. NO. ___ (10 12)

TYPE SAMPLE __ (13)

1 - REGULAR
2 - FLUORIDE
3 - MPN
4 - RAW

SAMPLING DATE ______ MO DAY YR [illegible]

______ ADDRESS OR LOCATION

FOR LABORATORY USE ONLY

SPECIAL REQUEST (20) ☐ 0 NONE ☐ 1 - REPEAT ☐ 2 - REPLACEMENT

SAMPLE CONDITION (21) ☐ 1 - GOOD ☐ 2 - DAMAGED ☐ 3 - INSUFFICIENT

☐ 4 OLD ☐ 5 - FAULTY CONTAINER ☐ 6 - RETURNED UNUSED CONTAINER

SAMPLE I D # ______ (22 25)

DATE RECEIVED ______ MO DAY/YR (26 31)

LACTOSE BROTH 24 HR. ___ (32) 48 HR ___ (33) BGB ___ (34)

FINAL ANALYSIS (35) ☐ 0 - NOT TESTED ☐ 1 - SAFE ☐ 2 - UNSAFE

REMARKS ______

Figure 1. Sample sheet accompanying each sample.

ENVIRONMENTAL PROTECTION AGENCY
Water Quality Office
Water Hygiene Division
Bacteriological Survey for
Water Laboratories

Indicates conformity with the 13th edition of Standard Methods for the Examination of Water and Wastewater (1971).

Survey By/ Harry D. Nash

X = Deviation U = Undetermined
O = Not Used

Laboratory State of Wyoming, Dept. of Health and Social Services, Div. of Labs.

Location State Office Building Cheyenne, Wyoming 82001

Date 9/15/7[illegible]

Sampling and Monitoring Response

1. Location and Frequency
   - Representative points on system. . . . . ____
   - Frequency of sampling adequate . . . . ____
2. Collection Procedure
   - Faucets with aerators should not be used. . . . . ____
   - Flush tap 1 min. prior to sampling . . . . ____
   - Pump well 1 min. to waste prior to sampling . . . . ____
   - River, stream, lake, or reservoir sampled at least 6 inches below surface and toward current. . . . . ____
   - Minimum sample not less than 100 ml not wide mouth. X
   - Ample air space in bottle for mixing. X
   - Promptly identify sample legibly and indelibly . . . . ____
3. Sample Bottles Municipal samples in glass bottles
   - Wide mouth, glass or plastic bottles of 90 ml capacity. X
   - Sample bottles capable of sterilization and rinse . . . . ____
   - Closure: Private samples in plastic whirl pack bags.
     - a. Glass stoppered bottles protected with metal foil, rubberized cloth or kraft type paper . . . . ____
     - b. Metal or plastic screw cap with leakproof liner . . . . ____
   - Sodium thiosulfate added for dechlorination. . . . . ____
     - Concentration 100 mg/l added before sterilization . . . . ____
   - Chelation agent for stream samples (optional). . . . . ____
     - Concentration 372 mg/l added before sterilization . . . . ____
4. Transportation and Storage
   - Complete and accurate data accompanies sample X
   - Transit time for potable water samples should not exceed 48 hrs, preferably within 30 hrs . Not examined if over 48 hrs. . . ____
   - Transit time for source waters, reservoirs, and natural bathing waters should not exceed 6 hrs . . . . ____
   - All samples examined within 2 hours of arrival . . . . ____

EPA-103 (Cin)
(Rev. 3-71)

Laboratory State of Wyoming, Dept. of Health & Social Services, Div. of Labs. | Location State Office Bldg. Cheyenne, Wyoming 82001 | Date 9/16/71

4. Transportation and Storage (continued)
   Sample refrigeration mandatory on stream samples, optional on potable water samples. . . . . ____

5. Record of Laboratory Examination
   Results assembled and available for inspection . . . . ____
   Number of Tests per year
   MPN Test - Type of sample Municipal and Private
   Confirmed (+) 392 (-) 7,719 (Total) 8,111
   Completed (+) 0 (-) 0 (Total) 0

   MF Test - Type of sample ____
   Direct Count (+) ____ (-) ____ (Total) ____
   Verified Count (+) ____ (-) ____ (Total) ____

   Data processed rapidly through laboratory and engineering sections. . . ____
   Unsatisfactory sample defined as 2 1 or more positive tubes per MPN test or 5 or more colonies per 100 ml in MF test . . . . ____
   High priority placed on alerting operator to unsatisfactory potable water results . . . . ____
   Prompt resampling for unsatisfactory samples . . . . ____

6. Laboratory Evaluation Service
   State program to evaluate all laboratories which examine potable water supplies. . . . . ____
   Frequency of surveys on a — year basis. . . . . ____
   State survey officer (Name) None . . . . ____
   Status of laboratory evaluation service. . . . . ____
   Total 1 labs known to examine water State lab only

   0 approved laboratories

   0 provisional laboratories

Laboratory Apparatus

7. Incubator
   Manufacturer Precision Model Model 6
   Sufficient size for daily work load . . . . ____
   Maintain uniform temperature in all parts (± 0.5°C). . . . . ____
   Accurate thermometer with bulb immersed in liquid on top and bottom shelves. . . . . ____
   Daily record of temperature or use of recording thermometer sensitive to 0.5°C change . . . . ____
   Incubator not subject to excessive room temperature variations beyond a range of 50 - 80° F . . . . ____

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8. Incubator Room (Optional) Manufacturer ____

Well insulated, equipped with properly distributed heating and humidifying units for optimum environmental control . . . . . ____

Shelf area used for incubation must conform to 35°C ± 0.5 temperature requirement. . . . . ____

Accurate thermometers with bulb immersed in liquid. . . . . ____

Daily record of temperature at selected areas or use recording thermometer sensitive to 0.5°C changes . . . . ____

9. Water Bath

Manufacturer Magic Whirl Model Blue M

Sufficient size for fecal coliform tests . . . . ____

Maintain uniform temperature 44.5°C ± 0.2°C. . . . . ____

Accurate thermometer immersed in water bath . . . . ____

Daily record of temperature or use of recording thermometer sensitive to 0.2°C changes . . . . ____

10. Hot Air Sterilizing Oven

Manufacturer Electric Commercial Oven Model ____

Size sufficient to prevent crowding of interior . . . . ____

Constructed to insure a stable sterilizing temperature . . . . ____

Equipped with accurate thermometer in range of 160-180°C or with recording thermometer X

11. Autoclave

Manufacturer Castle Model Thermatic 60

Size sufficient to prevent crowding of interior . . . . ____

Constructed to provide uniform temperature up to and including 121°C . . . . ____

Equipped with accurate thermometer with bulb properly located to register minimal temperature within chamber . . . . ____

Pressure gage and operational safety valve . . . . ____

Steam source from saturated steam line, or from gas or electrically heated steam generator . . . . ____

Reach sterilization temperature in 30 min. . . . . ____

Pressure cooker may be used only if provided with a pressure gage and thermometer with bulb 1 in. above water level . . . . ____

12. Thermometers

Accuracy checked with thermometer certified by National Bureau of Standards or one of equivalent accuracy. X

Liquid column free of discontinuous sections and graduation marks legible . . . . ____

Laboratory State of Wyoming, Dept. of Health & Social Services, Div. of Labs.	[illegible] Bldg. Cheyenne, Wyoming 82001	Date 8/18/71

13. pH Meter

Manufacturer Corning Model Mod 7

Electronic pH meter accurate to 0.1 pH units. . . . . ____

14. Balance

Balance with 2 g sensitivity at 150 g load used for general media preparations, Type Torsion Balance . . . . ____

Analytical balance with 1 mg sensitivity at 10 g load used for weighing quantities less than 2 g, Type________ . . . ____

Appropriate weights of good quality for each balance . . . . ____

15. Microscope and Lamp

Preferably binocular wide field, 10 to 15 diameters magnification for MF colony counts, Type________ . . . . . . ____

Fluorescent light source for sheen discernment. . . . . ____

16. Colony Count

Quebec colony counter, dark-field model preferred for standard plate counts . . . . ____

17. Inoculating Equipment

Wire loop of 22 or 24 gauge chromel, nichrome, or platinum iridium, sterilized by flame . . . . ____

Single-service transfer loops of aluminum or stainless steel, presterilized by dry heat or steam. . . . . ____

Disposable single service hardwood applicators, presterilized by dry heat only. . . . . ____

18. Membrane Filtration Units

Manufacturer________Type________

Leak proof during filtration. . . . . O

Metal plating not worn to expose base metal . . . . ____

19. Membrane filters

Manufacturer________Type________

Full bacterial retention, satisfactory filtration speed . . . . O

Stable in use, glycerin free. . . . . ____

Grid marked with non-toxic ink . . . . ____

Presterilized or autoclaved 121°C for 10 min. . . . . ____

20. Absorbent Pads

Manufacturer________Type________

Filter paper free from growth inhibitory substances. . . . . O

Thickness uniform to permit 1.8 - 2.2 ml medium absorption . . . . ____

Presterilized or autoclaved with membrane filters . . . . ____

21. Forceps

Preferably round tip without corrugations. . . . . O

Forceps are alcohol flamed for use in MF procedure. . . . . ____

Glassware, Metal Utensils and Plastic Items

22. Media Preparation Utensils

Borosilicate glass . . . . ____

Stainless steel. . . . . ____

Utensils clean and free from foreign residues or dried medium . . . . ____

23. Pipets

Brand Kimax & Pyrex Type 10 ml

Calibration error not exceeding 2.5%. . . . . ____

Tips unbroken, graduation distinctly marked . . . . ____

Deliver accurately and quickly. ____

Mouth end plugged with cotton (optional) . . . . ____

24. Pipet Containers

Box, aluminum or stainless steel . some copper X

Paper wrapping of good quality sulfite paper (optional) . . . . ____

25. Petri Dishes

Brand ____________ Type ____________

Use 100 mm x 15 mm dishes for pour plates . . . . ____

Use 60 mm x 15 mm dishes for MF cultures . . . . ____

Clear, flat bottom, free from bubbles and scratches. . . . . ____

Plastic dishes may be reused if sterilized in 70% ethanol for 30 min. or by ultraviolet radiation . . . . ____

26. Petri Dish Containers

Aluminum or stainless steel cans with covers, coarsely woven wire baskets, char-resistant paper sacks or wrappings . . . . ____

27. Culture Tubes

Size sufficient for total volume of medium and sample portions . . . . ____

Borosilicate glass or other corrosive resistant glass . . . . ____

28. Dilution Bottles or Tubes

Borosilicate or other corrosive resistant glass . . . . ____

Screw cap with leak-proof liner free from toxic substances on sterilization . . . . ____

Graduation level indelibly marked on side of bottle or tube . . . . ____

Laboratory State of Wyoming, Dept. of Health & Social Services, Div. of Labs.	Location State Office Bldg. Cheyenne, Wyoming 82001	Date 9/16/71

Materials and Media Preparation

29. Cleaning Glassware

Dishwasher Manufacturer by hand Model ____________
Thoroughly washed in detergent at 160°F, cycle time ____________ . . ____
Rinse in clean water at 180°F, cycle time ____________ . . . . . . ____
Final rinse in distilled water, cycle time ____________ . . . . . . ____
Detergent brand Haemo sol
Washing procedure leaves no toxic residue . . . . ____
Glassware free from acidity or alkalinity . . . . ____

30. Sterilization of Materials

Dry heat sterilization (1 hr at 170°C)
  Glassware not in metal containers . . . . ____
Dry heat sterilization (2 hrs at 170°C) Temp. not checked
  Glassware in metal containers. X
  Glass sample bottles . . . . ____
Autoclaving at 121°C for 15 min . . . . ____
  Plastic sample bottles . . . . ____
  Dilution water blanks. . . . . ____

31. Laboratory Water Quality

Still manufacturer Corning Construction Material glass
Demineralizer with Crystalab recharge frequency
Protected storage tank . . . . ____
Supply adequate for all laboratory needs. . . . . ____
Free from traces of dissolved metals or chlorine . . . . ____
Free from bactericidal compounds as measured
  by bacteriological suitability test . . . . ____
Bacteriological quality of water measured once each year
  by suitability test or sooner if necessary X

32. Buffered Dilution Water

Stock phosphate buffer solution pH 7.2 . . . . ____
Prepare fresh stock buffer when turbidity appears . . . . ____
Stock buffer autoclaved and stored at 5 - 10°C . . . . ____
1.25 ml stock buffer per 1 liter distilled water. . . . . ____
Dispense to give ~~[illegible]~~ 9 ± 0.2 ml after autoclaving. . . . . . . ____

33. pH Measurements

Calibrate pH meter against appropriate standard buffer prior to use . . ____
Standard buffer brand ____________ pH 7.0
Check the pH of each sterile medium batch or at least one batch
  from each new medium lot number. . . . . ____

33. pH Measurements (Continued)
Maintain a pH record of each sterile medium batch, the date and lot number . . . . ____

34. Sterilization of Media
Carbohydrate media sterilized 121°C for 12 min . . . . ____
All other media autoclaved 121°C for 15 min . . . . ____
Tubes packed loosely in baskets for uniform heating and cooling . . . . ____
Timing starts when autoclave reaches 121°C . . . . ____
Total exposure of carbohydrate media to heat not over 45 min . . . . . ____
Media removed and cooled as soon as possible after sterilization . . . ____

35. Storage
Dehydrated media bottles kept tightly closed and stored at less than 30°C . . . . ____
Dehydrated media not used if discolored or caked . . . . ____
Sterile culture media stored in clean area free from contamination and excessive evaporation . . . . ____
Sterile batches used in less than 1 week . . . . ____
All media protected from sunlight . . . . ____
If media is stored at low temperatures, it must be incubated overnight and any tubes with air bubbles discarded . . . . ____

Culture Media - Specifications

36. Lactose Broth
Manufacturer ____________________ Lot No. ____________
Single strength composition 13 g per liter distilled water . . . . O
Single strength pH 6.9 ± 0.1, double strength pH 6.7 ± 0.1 . . . . . . ____
Not less than 10 ml medium per tube . . . . ____
Composition of medium after 10 ml sample is added must contain 0.013 g per ml dry ingredients . . . . ____

37. Lauryl Tryptose Broth
Manufacturer BBL Lot No. 101656
Single strength composition 35.6 g per liter distilled water . . . . . . ____
Single strength pH 6.8 ± 0.1, double strength pH 6.7 ± 0.1 . . . . . . ____
Not less than 10 ml medium per tube . . . . ____
Composition of medium after 10 ml sample is added must contain 0.0356 g per ml of dry ingredients . . . . ____

38. Brilliant Green Lactose Bile Broth
Manufacturer Difco Lot No. 523193

38. Brilliant Green Lactose Bile Broth (Continued)
    Correct composition, sterility and pH 7.2. . . . . ____
    Not less than 10 ml medium per tube . . . . ____

39. Eosin Methylene Blue Agar
    Manufacturer ___ (Levine's) EMB ________ Lot No. ________
    Medium contains no sucrose, Cat. No. ________________
    Correct composition, sterility and pH 7.1. . . . . ____

40. Plate Count Agar (Tryptose Glucose Yeast Agar)
    Manufacturer ________________ Lot No. ________
    Correct composition, sterility and pH 7.0 ± 0.1 . . . . ____
    Free from precipitate. . . . . ____
    Sterile medium not remelted a second time after sterilization. . . . . ____

41. EC Medium
    Manufacturer ____Difco____ Lot No. ____564079____
    Correct composition, sterility and pH 6.9. . . . . ____
    Not less than 10 ml medium per tube . . . . ____

42. M-Endo Medium
    Manufacturer ________________ Lot No. ________
    Correct composition and pH 7.1 - 7.3 . . . . __O__
    Reconstituted in distilled water containing 2% ethanol. . . . . ____
    Heat to boiling point, promptly remove and cool . . . . ____
    Store in dark at 2 - 10°C . . . . ____
    Unused medium discarded after 96 hrs . . . . ____

43. M-FC Broth
    Manufacturer ________________ Lot No. ________
    Correct composition and pH 7.4 . . . . __O__
    Reconstituted in 100 ml distilled water containing 1 ml of
        a 1% rosolic acid reagent. . . . . ____
    Stock solution of rosolic acid discarded after 2 weeks or
        when red color changes to muddy brown . . . . ____
    Heat to boiling point, promptly remove and cool . . . . ____
    Store in dark at 2 - 10°C . . . . ____
    Unused medium discarded after 96 hrs . . . . ____

44. ________________ Broth
    Manufacturer ________________ Lot No. ________
    Correct composition and pH . . . . ____

45. ________________ Agar
    Manufacturer ________________ Lot No. ________

45. ______________ Agar (Continued)

Check composition and pH. ____

Multiple Tube Coliform Test

46. Presumptive Procedure

Lactose broth ______________ lauryl tryptose broth ______________

Shake sample vigorously . . . . nrl . . . . ____

Potable water: 5 standard portions, either 10 ml or 100 ml . . . . ____

Stream monitoring: multiple dilutions . . . . ____

Incubate tubes at 35° ± 0.5°C for 24 ± 2 hr . . . . ____

Examine for gas ______ any gas bubble positive . . . . ____

Return negative tubes to incubator . . . . ____

Examine for gas at 48 ± 3 hr from original incubation . . . . ____

47. Confirmed Test

Promptly submit all presumptive tubes showing gas production before or at 24 hr and 48 hr periods to Confirmed Test . . . . ____

a. Brilliant green lactose broth

Gently shake presumptive tube or mix by rotating . . . . ____

Transfer one loopful of positive broth or one dip of applicator from presumptive tube to brilliant green lactose broth. . . . . . ____

Incubate at 35° ± 0.5°C and check at 24 hrs for gas production. . . ____

Reincubate negative tubes for additional 24 hrs and check for gas production . . . . ____

Calculate MPN or report positive tube results. . . . . ____

b. Endo or eosin methylene blue agar plates adequate streaking to obtain discrete colonies separated by 0.5 cm . . . . ____

Incubate at 35° ± 0.5°C for 24 ± 2 hr . . . . ____

Typical nucleated colonies with or without sheen are coliforms . . ____

If atypical unnucleated pink colonies develop, result is doubtful and completed test must be applied. . . . . ____

If no colonies or only colorless colonies appear, the confirmed test is negative. ____

48. Completed Test

Applied to all potable water samples or a proportion each three months to establish the validity of the confirmed test in determining their sanitary quality. . . . . __Y__

Applied to positive confirmed tubes or to doubtful colonies on differential medium. . . . . ____

Streak positive confirmed tubes on Endo or EMB plates for colony isolation. . . . . ____

use Levine EMB for Water bacteriology

48. Completed Test (Continued)

Choice of selected isolated colony for verification should be one typical or two atypical to lactose or lauryl tryptose broth and to agar slant for Gram stain. ____

Incubate at 35°C ± 0.5°C for 24 hrs or 48 hrs . . . . ____

Gram negative rods without spores and gas in lactose tube with 48 hrs in positive Completed Test . . . . ____

Membrane Filter Coliform Test

49. Application as Standard Test

Use as a standard test for determining potability of water after demonstration by parallel testing that it yields information equal to that from the multiple-tube fermentation procedure . . . . O

50. MF Procedure

Filter funnel and receptacle sterile at start of series. . . . . O

Rapid funnel resterilization by UV, flowing steam or boiling water acceptable. . . . . ____

Membrane filter cultures and technician eyes should not be subject to UV radiation leaks . . . . ____

Filtration volume not less than 50 ml for potable water; multiple dilutions for stream pollution . . . . ____

Rinse funnel by flushing several 20 - 30 ml portions of sterile buffered water through MF . . . . ____

Remove filter with sterile forceps . . . . ____

Roll filter over M-ENDO medium pad or agar so air bubbles will not form . . . . ____

51. Incubation

In high humidity or in tight fitting culture dishes . . . . O

At 35°C ± 0.5°C for 22 - 24 hrs . . . . ____

52. Counting

All colonies with a metallic yellowish green surface sheen . . . . O

If coliforms are found in potable samples, verify by transfers to lactose broth, then to BGB broth for evidence of gas production at 35°C within 48 hr limit. . . . . ____

Calculate direct count in coliform density per 100 ml. . . . . ____

53. Standard MF test with Enrichment

Incubate MF after filtration on pad saturated with lauryl tryptose broth for 1 1/2 - 2 hr at 35°C ± 0.5°C . . . . O

53. Standard MF test with Enrichment (Continued)

Transfer MF culture to M-Endo medium for a final 20 - 22 hr incubation at 35°C ± 0.5°C. . . . . O

Count sheen colonies, verify if necessary, and calculate direct count in coliform density per 100 ml . . . . ____

Supplementary Bacteriological Methods

54. Standard Plate Count

Plate not more than 1 or less than 0.1 ml (sample or dilution) . . . . . O

Add 10 ml or more liquefied agar medium at a temperature between 43 - 45°C . . . . ____

Melted medium stored for no more than 3 hr at 43 - 45°C . . . . ____

Liquid agar and sample portion thoroughly mixed by gently rotating to spread mixture evenly . . . . ____

Count only plates with between 30 and 300 colonies, exception being 1 ml sample with less than 30 colonies . . . . ____

Record only two significant figures and calculate as "standard plate count at 35°C per 1 ml of sample". . . . . ____

55. Fecal Coliform Test

a. Multiple Tube Procedure stream samples

Applied as an EC broth confirmation of all positive presumptive tubes. . . . . ____

Place EC tubes in water bath within 30 min of transfers . . . . . . ____

Incubate at 44.5°C ± 0.2°C for 24 hrs . . . . ____

Gas production is positive test for fecal coliforms. . . . . ____

Calculate MPN based on combination of positive EC tubes . . . . . ____

b. Membrane Filter Procedure

Following filtration place MF over pad saturated with M-FC broth . . . . O

Place MF cultures in water-proof plastic bag and submerge in water bath within 30 min. . . . . ____

Incubate at 44.5°C ± 0.2°C for 24 hrs . . . . ____

All blue colonies are fecal coliforms. . . . . ____

Calculate direct count in density per 100 ml . . . . ____

56. Delayed-Incubation Coliform Test

After filtration, place MF over pad of M-Endo containing 3.2 ml of a 12% sodium benzoate solution per 100 ml of medium . . . . O

Addition of 50 mg cycloheximide per 100 ml of preservative medium for fungus suppression is optional . . . . ____

Transport culture by mail service to laboratory within 72 hours . . . . ____

56. Delayed-Incubation Coliform Test (Continued)

Transfer MF cultures to standard M-Endo medium at laboratory. . . . . O

Incubate at 35°C ± 0.5°C for 20 - 22 hr . . . . ____

If at time of transfer, growth is visible, hold in refrigerator till end of work day then incubate at 35° overnight (16 - 18 hr period) . . . . ____

Count sheen colonies, verify if necessary, and calculate direct count in coliform density per 100 ml . . . . ____

57. Additional Test Capabilities

Fecal streptococci ________ Method ____________________

Pseudomonas aeruginosa ________ Method ____________________

Staphylococcus ________ Method ____________________

Salmonellae ________ Method ____________________

Biochemical tests ________ Purpose ____________________

Serological tests ________ Purpose ____________________

Other ________ Purpose ____________________

Laboratory Staff and Facilities

58. Personnel

Adequately trained or supervised for bacteriological examination of water . . . . ____

Laboratory staff 1 (Total) Prep room staff 1 (Total)

59. Reference Material

Copy of the current edition of Standard Methods available in the laboratory . only 11th edition available X

State or federal manuals on bacteriological procedures for water available for staff use . . . . ____

60. Physical Facilities

Bench-top area adequate for periods of peak work in processing samples. X

Sufficient cabinet space for media and chemical storage . . . . ____

Office space and equipment available for processing water examination reports and mailing sample bottles . . . . ____

Facilities clean, with adequate lighting, ventilation and reasonably free from dust and drafts X

61. Laboratory Safety

Proper receptacles for contaminated glassware and pipettes . . . . . . ____

Laboratory State of Wyoming, Dept. of Health & Social Services, Div. of Labs.	Location State Office Bldg. Cheyenne, Wyoming 82001	Date 9/16/71

61. Laboratory Safety (Continued)

Adequately functioning autoclaves with periodic inspection and maintenance. . . . . ____
Accessible facilities for hand washing . . . . ____
Proper maintenance of electrical equipment to prevent fire and electrical shock . . . . ____
Convenient gas and electric outlets. . . . . ____
First aid supplies available and not out-dated . . . . ____

62. Remarks

EPA-103 (Cin)
(Rev. 3-71)

Appendix K

Report of a Survey of the
Wyoming Department of Agriculture
Division of Laboratories
Laramie, Wyoming 82070

by

Earl F. McFarren, Chief
Analytical Quality Control
Water Hygiene Division

Mr. Jack Hoffbuhr, Water Supply Consultant, Region VIII, met me about 7:15 a.m. on Monday morning Sept. 27, 1971, at a motel near the Denver airport and we drove to Laramie, Wyoming. We arrived about 9:00 a.m. and went directly to the Department of Agriculture Laboratory on the University of Wyoming campus. The laboratory is under the direction of Michael Purko, State Chemist. In addition to him, three other chemists and two technicians are employed by the state to carry out all chemical analyses. The laboratory also employs two bacteriologists and two secretaries and/or clerks. Since the laboratory is under the Department of Agriculture, it is primarily responsible for the analysis of feeds, fertilizers, pesticide formulations and irrigation waters. It also, however, is responsible for milk, food and drug analysis and analyzes water for the U.S. Geological survey, State Fish and Game, the State Department of Health and the Atomic Energy Commission "Gas Buggy" program.

In addition to Mr. Purko, I met the three other chemists, Ray Ritchie, Robert Frhag, and Tom Spedding and spent all of Monday and about an hour Tuesday morning discussing with them the operation of the laboratory, reviewing their records, and inspecting the laboratory and equipment.

We left Laramie about 10:00 a.m. and arrived in Cheyenne about 11:00 a.m. In Cheyenne we met briefly with Mr. Arthur E. Williamson, State Sanitary Engineer and Dr. William Ebinger, Division of Dental Hygiene. We also tried to see Mr. Robert Sundin, Chief of the Radiological Health, Air Pollution and Occupational Health Laboratory but he was out of his office all morning and did not return when expected in the afternoon. I did, however, contact him by telephone from Cincinnati on the following day. We also tried to see Dr. Lee who is in charge of the Public Health Laboratory in Cheyenne but he was not available. Dr. Lee's laboratory does serology,

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bacteriology (including potable waters), and most recently has acquired a chemist to do blood alcohol determinations. He also has been trying to spend some time in the development of an auto-analyzer procedure for the determination of water fluorides.

Water Chemistry

There are ninety-four water supplies of significance in the state. Those are composed of 62 ground water supplies, 24 surface water supplies and 8 mixed supplies. Six of these supplies are fluoridated.

The records of the Department of Agriculture Laboratory indicate, however, that only 5 municipal water supplies were analyzed last year and these were analyzed for only four of the substances requested by the drinking water standards; namely, chlorides, sulfates, nitrates and total dissolved solids. Apparently some fluorides were run by one of the sanitary engineers in Cheyenne using the Alizarin visual method, but this was not done routinely and no records were available. Because of this rather deplorable situation, Dr. William Ebinger of the Division of Dental Hygiene has purchased an Orion electrode and meter and is attempting to monitor all fluoridated supplies and observe if there is any seasonal variation in some naturally occurring high fluoride supplies.

About 1150 private household or livestock water supplies were analyzed last year but these were all done at the request of and paid for by the individual owner. The state charges two dollars for the determination of bacterial count, total solids, hardness, sulfate, and nitrate.

The last available assembled record of analysis of municipal water supplies is dated 1962. At that time a partial (total solids, hardness, alkalinity, sulfates, iron and fluoride) chemical analysis was carried out on about 75 municipal water supplies.

Laboratory Equipment

The laboratories are only 2 or 3 years old, and in general, are well-equipped and spacious. They have, for example, an atomic absorption spectrophotometer and three gas chromatographs and are considering buying another atomic absorption spectrophotometer. Considering the amount and versatility of the laboratory work, however, the laboratory is grossly understaffed.

Compliance with Standard Methods

Of the four substances required by the drinking water standards which they are running routinely, they are complying with standard methods. As indicated on the attached survey form (see items 1, 2, 3, and 4), they never run color, odor, turbidity, carbon chloroform extracts, barium, silver, radium 226 or strontium 90 and only rarely do they do cyanide, fluorides, surfactants, arsenic, cadmium, chromium, copper, iron, lead, manganese, selenium, mercury, zinc or gross beta (Radiological Health Laboratory in Cheyenne).

Conclusions

1. Only 4 out of 26 substances specified by the drinking water standards are being run routinely.

2. The Department of Agriculture laboratory has the capability (instruments available) of doing complete metal analysis by atomic absorption spectrophotometry and of doing pesticide analysis by gas chromatography but only rarely do they use either for water analysis.

3. The Radiological Health Laboratory in Cheyenne has the capability of running gross beta but nothing more (item 29) and even this is not done because of lack of time.

4. There are approximately 95 to 100 municipal water supplies in the state, but only 5 of these were analyzed last year and only for four substances. The last partial chemical analysis carried out on all municipal supplies was in 1962 (items 35 and 36).

Recommendations

1. It is recommended that at least three additional chemists be hired in order to be able to carry out the required metal and radiochemical analysis.

2. Complete chemistries should be run (all 26 determinations) at least twice each year on all surface water supplies and at least once every three years on all ground water supplies (item 37).

3. Samples for metal analysis should be acid preserved and samples for nitrate analysis should be preserved with mercuric chloride or else refrigerated at 4°C until analyzed (item 32).

4. Glass rather than plastic is recommended for the collection of pesticide samples (item 31b).

5. Sample identification sheets do not contain sufficient information and hence, need to be redesigned (item 33).

6. All fluoridated water supplies should be checked at regular intervals, as otherwise the chemical is probably being wasted or else doing more harm than good.

7. Since the Department of Agriculture Laboratory is already overloaded and obviously more pollution oriented than health oriented, it is believed that it would be more feasible to build up the Public Health Laboratory in Cheyenne rather than add to the staff in Laramie.

Earl F. McFarren

SURVEY OF WATER CHEMISTRY LABORATORIES

ENVIRONMENTAL PROTECTION AGENCY
Office of Water Programs
Water Hygiene Division

Indicating conformity with the 13th edition of Standard Methods for the Examination of Water and Wastewater (1971).

Survey by Earl F. McFarren
Date 9-27-71

X = Deviation U = Undetermined
O = Not Used

Laboratory Dept. of Agriculture
Street
City Laramie State Wyoming
Director Michael Purko
Chief Chemist Ray Ritchie
Water Supply Chief Arthur E. Williamson

Substances Determined

			Method	
1	Physical determinations			
	a	color		0
	b	odor		0
	c	turbidity		0
2	Miscellaneous anions, organics and solids			
	a	chlorides	mercuric nitrate titration	
	b	cyanide	pyridine-pyrazolone	
	c	carbon chloroform extract		0
	d	fluorides	SPADNS without distillatin	
	e	nitrates	phenoldisulfonic acid	
	f	sulfates	gravimetric	
	g	surfactants	methylene blue	
	h	total dissolved solids	gravimetric	
	i	other		
3	Metals			
	a	arsenic	mercuric bromide stain	
	b	barium		0
	c	cadmium	atomic absorption	
	d	chromium	atomic absorption	
	e	copper	atomic absorption	
	f	iron	atomic absorption and phenanthroline	
	g	lead	atomic absorption with extraction	
	h	manganese	atomic absorption and persulfate	
	i	selenium	diaminobenzidine	
	j	silver		0
	k	mercury	Cold vapor atomic absorption	

l zinc atomic absorption

m other

4 **Radioactivity**

a gross beta

b radium 226 0

c strontium 90 0

d other

5 **Pesticides**

a aldrin food, pesticide formulations and

b chlordane irrigation waters are occasionally

c dieldrin analyzed, but rarely are potable

d DDT waters analyzed

e endrin

f heptachlor

g heptachlor epoxide

h methoxychlor

i lindane

j toxaphene

k total organic phosphates plus carbamates

l chlorinated phenoxy alkyl pesticides

m other

Laboratory Apparatus

	Make	Model	
6 Color comparators			
a visual			
b filter photometer			
7 Spectrophotometer			
a visible	Beckman	Model B	
b flame	Beckman	Model DU-2	
c other	Infra-red	PE-21	
8 Atomic absorption spectrophotometer			
a air-acetylene burner	Perkin-Elmer	303	
b nitrous-oxide burner	Perkin-Elmer	303	
c cold vapor (flameless)	Perkin-Elmer	303	
9 Gas chromatographic equipment			
a electron capture	Perkin-Elmer	801	
b flame ionization	Beckman	GC-2	
c flame photometric	Micro-Tek	220	
d microcoulometric			0
e other			

Survey of Water Chemistry Laboratories

Laboratory

Location

Date

		Make	Model	
10	Other chromatographic equipment			
a	thin-layer	have		
b	Kuderna-Danish evaporator	have		
c	other			
11	Turbidimeter	Helige		
12	Amperometer			
13	Titrimeter			
14	pH meter	1 Beckman, 2 Sargents	Model LS	
15	Fluoride electrode			
16	Arsine generator	have		
17	Cyanide still	have		
18	Fluoride still			0
19	Carbon-chloroform extraction equipment			
a	high or low flow columns			0
b	carbon drying oven			0
c	extraction apparatus			0
d	manifold for solvent evaporation			0
20	Drying oven	have		
21	Steam bath	have		
22	Hot water bath	have		
23	Muffle furnace	have		
24	Distilled water still	have		
25	Water deionizer	have		
26	Conductivity meter	have		
27	Balance, sensitive to 0.1 mg	have		
28	Automatic analyzer for			
a	nitrates plus nitrites			
b	nitrites			
c	chloride			
d	sulfate			
e	cyanide			
f	fluoride			
g	other			

		Make	Model	
29	Radiation Counting Equipment			
a	internal proportional counter		Sharp, wide-beta	
b	alpha-scintillation counter			
c	other			0
30	Other instruments or Equipment			
a				
b				
c				
d				

Samples

31 Containers

a Non-reusable plastic containers preferred for the collection of samples for general inorganic analysis. . . . . ______

b Glass bottles with teflon lines caps preferred for collection of pesticide samples X

c Other kind . . . . ______

32 Preservatives

a Samples for metal analysis preserved by the addition of nitric acid to a pH of about 2.0 0

b Nitrates and methylene blue active substances preserved by addition of mercuric chloride 0

c Cyanide preserved by the addition of sodium hydroxide to a pH of 11 0

d No known or required preservative for turbidity, color, pH, chloride, sulfate, fluoride, specific conductance and total dissolved solids . . . . ______

e If no preservative is used, in general samples are analyzed within 72 hrs . . . . ______

33 Identification

a Every bottle should be identified by attaching and appropriately inscribed tag, a label or a number corresponding to a sample identification sheet X

b The minimum information required on the tag or correspondingly numbered sheet includes; name of the water supply sampled, location of sampling site, exact date and time of collection, type of sample (raw, finished, grab or composite) by whom collected, and kind of preservative if added X

Laboratory Location Date

Samples

34 Collection

a Samples from wells collected after pumping for a sufficient time to assure that the sample is representative of the ground water which feeds the well . . . . ______

b Finished (treated) water sampled at the plant by use of a pipeline drip device or the collecting and compositing of hourly (or other interval) samples . . . . ______

c Distribution samples obtained at several different points in the system; usually grab samples obtained without first flushing the line, although both kinds of samples may at times be desirable . . . . ______

Records

35 Availability

a Assay results assembled and available for inspection X

b Notation made of those water supplies which did not comply with one or more standards, and some sort of follow-up program instigated . . . . ______

36 Number analyzed annually

a private supplies 1194 ______

b semi-public ______ ______

c municipal ______ ______

1) sources ______ ______

2) finished 5 ______

3) distribution ______ ______

37 Frequency

a Physical characteristics measured at least once a week and preferably everyday at the treatment plant X

b Chemical characteristics determined at least once every three years on ground water supplies and semi-annually on surface water supplies unless previous data has indicated a potential problem which needs to be monitored more frequently X

Laboratory

38 Physical facilities

a Bench top area adequate . . . . ______

b Sufficient cabinet space for chemicals and glassware . . . . ______

c Adequate hood space . . . . ______

d Office space available for record keeping and processing reports . . . . ______

e Space for storage and handling of bottles . . . . O

39 Glassware

a Thoroughly washed with suitable detergent and warm water . . . . ______

b Rinsed immediately in clean tap water to remove detergent . . . . ______

c Final rinse with distilled water . . . . ______

d Dichromate cleaning solution used for difficult to clean glassware . . . . ______

e Glassware used for pesticide analysis should receive a final rinse with A. R. grade acetone or ethyl acetate . . . . ______

40 Organization

a Total number of laboratories examing water__________ . . . . ______

b Water laboratory is a separate unit, and not part of a food, drug, or toxicological laboratory X

c Each of the other regional laboratories have the same capabilities . . . . ______

d Radiation chemistry is a part of the water laboratory X

Quality Control

41 Laboratory water quality

a Conductivity of water checked at regular intervals . . . . ______

b Use of deionized water for metal analysis . . . . ______

42 Control Samples

a A control sample of known composition (in addition to any necessary standards) is analyzed every time one or more unknown samples are analyzed X

b A control sample is available and used for each substance specified in the drinking water standards . . . . O

c A control chart has been constructed for each substance, and the precision of each determination has been calculated . . . . O

Survey of Water Chemistry Laboratories

Laboratory	Location	Date

43 **Reference Samples**

a **Accuracy and ability of laboratory to perform each analysis checked by requiring them to analyze an unknown reference sample(s) supplied by the surveying office or laboratory at least once a year** . . . . ________

Staff

44 **Personnel**

a **Total number of staff** 5 . . . . ________

b **Number with degrees in chemistry** 3 . . . . ________

c **Does state operate under a merit system** . . . . ________

d **Are job descriptions written** . . . . ________

e **Does state encourage attendance at professional meetings, short courses, etc.** . . . . ________

45 **Salaries**

a **Chief chemist** $13,000 . . . . ________

b **Assistant chemist** $11,700 . . . . ________

c **Aids** $5,100 . . . . ________

Appendix L

INFORMATION SHEET

Bacteriological - Yellowstone National Park and Grand Teton National Park provide full time personnel to perform bacteriological testing for those water supplies within the Parks. The tests are performed using the millipore filter technique in accordance with Standard Methods for The Examination of Water and Wastewater, 13th ed., APHA.

Yellowstone National Park performs an analysis on each water system every two weeks. Grand Teton National Park performs weekly analyses on each water system.

Bacteriological samples for the remaining Park Service areas are submitted to the Wyoming State Department of Health for analysis.

Chemical - All chemical analysis include trace elements and wet analyses. Chemical analyses at Yellowstone National Park are completed by contract with Montana State University, Bozeman, Montana.

The remaining chemical analyses in the other areas were performed by the Cincinnati laboratory of the Division of Water Hygiene, Community Water Supply Branch, EPA.

Construction and Operation - No significant changes are expected to occur in the water supply systems at Grand Teton National Park, Fort Laramie National Historic Site, Devils Tower National Monument or Bighorn Canyon Recreation Area. However, due to recommendations of this office some major changes are expected in FY 1973 in Yellowstone National Park as follows:

Donnelly Engineering - Laramie, Wyoming, has a contract to provide changes in the Yellowstone systems.

Mammoth Hot Springs - Complete treatment facilities, including coagulation, flocculation, sedimentation, filtration, chlorination and closed storage.

Grant Village - Identical to Mammoth Hot Springs, except that closed storage is already provided.

Canyon Village - Revision of present intake and filtration system to supply more water.

Old Faithful - Sand filtration, and additional storage.

Lake, Bridge Bay, Fishing Bridge - Revision and combining of intake structures to serve the entire area.

Norris Junction - Revision of intake structures and additional storage, filtration.

Madison Junction - Revision and combining of intake structures.

Tower Falls, Tower Junction, Roosevelt Lodge - Study feasibility of combining entire area to a common source; treatment and storage.

Classification and Status - is based on the recommendations of Public Health Service Publication No. 1820, Manual for Evaluating Public Drinking Water Supplies. Surveys and evaluations are made annually at Yellowstone National Park and Grand Teton National Park. Biennially, in the remaining areas.

SUMMARY OF NATIONAL PARK SERVICE WATER SUPPLIES

AREA: Grand Teton National Park   CALENDAR YEAR: 1970   DATE: September 1971

System Designation	Source	Type of Treatment	Bacteriological Quality				Chemical		Construction - Operation	
			Sampling Frequency Number req/mo.	Sampling Frequency Adequate	Samples Examined Last Yr.	Months BacT Limits Exceeded	Date Last Chemical	Limits Exceeded	Date Last Survey	Remarks
McCain's Marina	Ctnwood Creek	Chlorination	2	3 mos/op yes	12	none	1971	none	7/71	Public water supply. Direct intake on Cottonwood Crk. Needs kprovide filtratin Listed as "PROVISIONAL"
Rudd's Horse Conc.	Ctnwood Creek	Chlorination	2	3 mos/op yes	12	none	1971	none	7/71	Ditto
Exum's Climbing Sch.	Ctnwood Creek	Chlorination	2	3 mos/op yes	12	none	1971	none	7/71	Ditto
Elbo Ranch	Well	Chlorination	2	12 mos/op yes	25	1 - (2/100) JUNE ~~none~~	1971	none	7/71	Public water supply. Drilled well properly protected. Listed as "SATISFACTORY"
Triangle X Ranch	Springs	Filtration & Chlorination	2	3 mos/op yes	15	none	1971	none	7/71	Pbulic water supply. Infiltration gallery filtered and chlorinated. Listed as "SATISFACTORY"
Moose Headquarters & Residential	Taggart Lake	Chlorination Storage	2	12 mos/op yes	26	none	1971	none	7/71	Primarily serves NPS population. Direct intake on Beaver Creek. Needs filtration Listed as "PROVISIONAL"
Beaver Creek Resid.	"	"	2	"	22	none	1971	none	7/71	Ditto
Jenny Lake Lodge	Jenny Lake	Chlorination & Storage	2	3 mos/op yes	13	none	1971	none	7/71	Public water supply. Needs filtration Listed as "PROVISIONAL"
Jenny Lake Campgrd.	Jenny Lake	Chlorination & Storage	2	3 mos/op yes	14	none	1971	none	7/71	Public water supply. Storage Construction faulty. Needs filtration. Listed as "PROVISIONAL"
Signal Mtn. Lodge & Campgrounds	Drilled Well	Chlorination & storage	2	3 mos/op yes	14	none	1971	none	7/71	Public water supply. Listed as "SATISFACTORY"
Leeks Lodge	Drilled Well	Chlorination	2	3 mos/op yes	15	none	1971	none	7/71	Public water supply. Listed as "SATISFACTORY"

SUMMARY OF NATIONAL PARK SERVICE WATER SUPPLIES PAGE # 2

AREA: GRAND TETON NATIONAL PARK CALENDAR YEAR: XXXX 1970 DATE: September 1971

System Designation	Source	Type of Treatment	Bacteriological Quality				Chemical		Construction - Operation	
			Sampling Frequency Number req/mo.	Sampling Frequency Adequate	Samples Examined Last Yr.	Months BacT Limits Exceeded	Date Last Chemical	Limits Exceeded	Date Last Survey	Remarks
Jackson Lake Lodge	Springs & well	Chlorination and storage	2	3 mos/op yes	15	none	1971	none	7/71	Public water supply. Meadow Springs and Pilgrim Ck. well. Properly protected. Listed as "SATISFACTORY"
Moran Junction	Drilled Well	Chlorination Pressure storage.	2	12 mos/op yes	22	none	1971	none	7/71	Does not serve general public. Listed as "SATISFACTORY"
Gros Ventre C. G.	Drilled Well	Chlorination & pressure storage.	2	4 mos/op yes	17	None	1971	none	7/71	Public water supply. Listed as "SATISFACTORY"
Colter Bay	Pilgrim Creek well & springs	Chlorination & storage	2	12 mos/op yes	22	none	1971	none	7/71	Public water supply. 4 months public operation. 8 months NPS residential. Listed as "SATISFACTORY"

SUMMARY OF NATIONAL PARK SERVICE WATER SUPPLIES

AREA: YELLOWSTONE NATIONAL PARK CALENDAR YEAR: 1970 DATE: September 1971

System Designation	Source	Type of Treatment	Bacteriological Quality				Chemical		Construction - Operation	
			Sampling Frequency		Samples Examined Last Yr.	Months BacT Limits Exceeded	Date Last Chemical	Limits Exceeded	Date Last Survey	Remarks
			Number req/mo.	Adequate						
Apollinaris Spring	Spring	mineral/ not chlorinated.	2	3 mos/op yes	6	none all samples safe	1971	Hardness Alkalinity.	8/71	Spring is properly protected. Supplies one Comfort Station. Not utilized for drinking. Medicinal quality same as mineral Spas. Listed SATISFACTORY.
Beartooth Camp	Spring	None	2	3 mos/op yes	6	none all samples safe	1971	none	8/71	Supplies employee work camp. Spring is properly protected. not chlorinated. Listed as "SATISFACTORY"
Bechler Ranger Station	Drilled Well	none	2	3 mos/op no	4	none all samples safe	1971	none	8/71	Well is properly protected. Does not serve public. Pressure service system Listed as "SATISFACTORY"
Bridge Bay	Spring	Chlorination & Storage	2	3 mos/op yes	6	none all samples safe	1971	none	8/71	Spring is properly protected. Is a public water supply. Listed as "SATISFACTORY"
Canyon Village	Infilt. gallery 2 intakes	Filtration Chlorination & storage	2	3 mos/op yes	8	None all samples safe	1971	none	8/71	Public water supply. Filtered at reservoir with Permutit AVF. Listed as "SATISFACTORY"
East Entrance	Spring	Storage	2	3 mos/op no	3	1 (5/100)	1971	none	8/71	Does not presently serve public. Spring is properly protected. Recommend Chlorination. Listed as "PROVISIONAL"
Fishing Bridge	Spring	Chlorination Storage	2	3 mos/op yes	7	none all samples safe	1971	none	8/71	Serves the public. Spring is properly protected. Connected to Lake system. Listed as "SATISFACTORY"
Grant Village	Yellowstone Lake	Infiltration gallery. Storage. Chlor.	2	3 mos/op yes	8	1 - (1/100) July 1 - (1/100) Aug.	1971	none	8/71	Serves the public. Must have complete treatment. Minimum of sand filtration required. Listed as "UNSATISFACTORY"
Indian Creek C.G.	Drilled Well	Storage	2	3 mos/op ;yes	7	1 - (14/100)	1971	none	8/71	Serves the public. Chlorination required. Well is properly constructed and protected. Listed as "PROVISIONAL"
Lake	Springs	Chlorination and storage	2	3 mos/op yes	9	none	1971	none	8/71	Serves the public. Spring is properly protected. Aslo serves Fishing Bridge & Bridge Bay. Listed as "SATISFACTORY"
Lamar Ranger Statio	Spring	Storage	2	3 mos/op yes	8	1 - (1/100)	1971	none	8/71	Does not serve the public. Require Chlorination. Listed as "SATISFACTORY"

SUMMARY OF NATIONAL PARK SERVICE WATER SUPPLIES PAGE # 2

AREA: YELLOWSTONE NATIONAL PARK CALENDAR YEAR: 1970 DATE: September 1971

System Designation	Source	Type of Treatment	Bacteriological Quality				Chemical		Construction - Operation	
			Sampling Frequency		Samples Examined Last Yr.	Months BacT Limits Exceeded	Date Last Chemical	Limits Exceeded	Date Last Survey	Remarks
			Number req/mo.	Adequate						
Lewis Lake Campgrd.	Well	Chlorination Storage	2	3 mos/op yes	6	none all samples safe	1971	none	3/71	Serves the public. Is properly constructed and protected. Listed as "SATISFACTORY"
Madison Junction	Springs	Chlorination & storage	2	3 mos/op yes	6	none all samples safe	1971	none	8/71	Serves the public. Is properly protected. Listed as "SATISFACTORY"
Mammoth Hot Springs	Indian & Panther Creek	Open storage, settling, and chlorination	2	12 mos/op no	18	none	1971	none	8/71	Serves the public. Complete treatment is required. Streams are well protected from public use. Listed as "UNSATISFACT"
Norris Jct. & Campgrd.	Direct intake. Cattle Ck.	Chlorination and storage	2	3 mos/op yes	6	none	1971	none	8/71	Serves the public. Recommend minimum filtration. Listed as"PROVISIONAL"
North Entrance	City of Gardner, Montana	Coag., floc.; sedi/. and chlorination	2							Under inpsection of State of Montana
Old Faithful	dir. int. Firehole River	Chlorination and storage	2	5 mos/op yes	18	none	1971	none	8/71	Serves the public. Needs minimum of filtration and increase storage capacity. Listed as "PROVISIONAL"
Roosevelt Lodge	dir. int. Lost Crk.	Chlorination	2	3 mos/op yes	7	1 - (5/100) Aug.	1971	none	8/71	Serves the public. Needs protect watershed and intake; filtration/ improve storage; Listed as "UNSATISFACTORY"
Slough Creek Campgrd.	unnamed stream	infiltration gallery. Chlorination	2	8 mos/op yes	5	none	1971	none	8/71	Serves the public. Area is properly protected. Lsted as "SATISFACTORY"
South Entrance	Spring	none	2	3 mos/op yes ;	6	none	1971	none	8/71	Serves the public. Needs minimum of chlorination. Aslo need storage. Listed as "PROVISIONAL"
Stevens Creek	Spring	Storage	2	12 mos/op yes	18		1971	none	8/71	Isolated one man residence. Does not serve public. Requires no rating.
Tower Falls	Spring	Chlorination & Storage	2	3 mos/op yes	8	none	1971	none	8/71	Serves the public. Spring is properly protected. Need additional storage Listed as "SATISFACTORY"

SUMMARY OF NATIONAL PARK SERVICE WATER SUPPLIES PAGE # 3

AREA: YELLOWSTONE NATIONAL PARK CALENDAR YEAR: 1970 DATE: September 1971

System Designation	Source	Type of Treatment	Bacteriological Quality				Chemical		Construction - Operation	
			Sampling Frequency		Samples Examined Last Yr.	Months BacT Limits Exceeded	Date Last Chemical	Limits Exceeded	Date Last Survey	Remarks
			Number req/mo.	Adequate						
Tower Falls Ranger Station & Residential	Springs	none	2	3 mos/op yes	7	none	1971	none	8/71	Serves employees only. Spring is properly protected. Listed as "SATISFACTORY"
West Entrance	2-wells	Chlorination & storage	2	12 mos/op yes	20	none	1971	none	8/71	Serves the public. Wells are properly constructed and protected. Requires some structural changes. Listed -"PROVISIONAL'

SUMMARY OF NATIONAL PARK SERVICE WATER SUPPLIES

AREA: DEVILS TOWER NATIONAL MONUMENT

CALENDAR YEAR: 1970

DATE: September 1971

			Bacteriological Quality				Chemical		Construction - Operation	
System Designation	Source	Type of Treatment	Sampling Frequency Number req/mo.	Sampling Frequency Adequate	Samples Examined Last Yr.	Months BacT Limits Exceeded	Date Last Chemical	Limits Exceeded	Date Last Survey	Remarks
Headquarters and Residential	Spring & Well	Chlorination & storage	2	12 mos/op yes	24	none	1970	none	6/71	Public water supply. Spring and well are properly constructed and operated. Listed as "SATISFACTORY"
Visitors Center	Spring & Well	Chlorination & storage	2	12 mos/op yes	24	none	1970	none	6/71	Ditto

SUMMARY OF NATIONAL PARK SERVICE WATER SUPPLIES

AREA: BIGHORN CANYON NATIONAL RECREATION AREA CALENDAR YEAR: 1970 DATE: September 1971

			Bacteriological Quality				Chemical		Construction - Operation	
System Designation	Source	Type of Treatment	Sampling Frequency Number req/mo.	Sampling Frequency Adequate	Samples Examined Last Yr.	Months BacT Limits Exceeded	Date Last Chemical	Limits Exceeded mg/l	Date Last Survey	Remarks
Horseshoe Bend	Spring	Chlorination & Storage	2	5 mos/op yes	13	none	1971	SO_4- 380 TDS -830	8/31	Publix water supply. No other source available. Spring is properly constructed & protected. Listed as "SATISFACTORY"

SUMMARY OF NATIONAL PARK SERVICE WATER SUPPLIES

AREA: FORT LARAMIE NATIONAL HISTORIC SITE CALENDAR YEAR: 1970 DATE: 1September 1971

			Bacteriological Quality				Chemical		Construction - Operation	
System Designation	Source	Type of Treatment	Sampling Frequency Number req/mo.	Adequate	Samples Examined Last Yr.	Months BacT Limits Exceeded	Date Last Chemical	Limits Exceeded	Date Last Survey	Remarks
Visitors Center and Museum	Drilled Well	Chlorination & pressure storage	2	12 mos/op yes	23	none	5/71	none	5/71	Public water supply. Properly protected and construction is good. Dual Chlorinator system. Listed as "SATISFACTORY"

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Appendix M

Incidence of Water-Borne Disease

	Amebiasis	Hepatitis*	Salmonellosis	Shigellosis	Typhoid
1962					
Reported Wyo. Cases	---	93	3	10	2
Reported U. S. Cases	3,048	53,016	9,680	12,443	608
Percent in Wyo.	---	0.18	0.03	0.08	0.34
1963					
Reported Wyo. Cases	---	40	4	---	---
Reported U. S. Cases	2,886	42,974	15,390	13,009	566
Percent in Wyo.	---	0.09	0.03	---	---
1964					
Reported Wyo. Cases	---	102	2	1	1
Reported U. S. Cases	3,304	37,740	17,144	12,984	501
Percent in Wyo.	---	0.27	0.01	<0.01	0.20
1965					
Reported Wyo. Cases	1	61	1	2	1
Reported U. S. Cases	2,768	33,856	17,161	11,027	454
Percent in Wyo.	0.04	0.18	<0.01	0.02	0.22
1966					
Reported Wyo. Cases	5	57	2	3	---
Reported U. S. Cases	2,921	32,859	16,841	11,888	378
Percent in Wyo.	0.17	0.17	0.01	0.03	---
1967					
Reported Wyo. Cases	3	70	4	---	2
Reported U. S. Cases	3,157	38,909	18,120	13,474	396
Percent in Wyo.	0.10	0.18	0.02	---	0.50
1968					
Reported Wyo. Cases	1	39	3	---	9
Reported U. S. Cases	3,005	45,893	16,514	12,180	3.95
Percent in Wyo.	0.03	0.09	0.02	---	2.28
1969					
Reported Wyo. Cases	3	78	5	3	1
Reported U. S. Cases	2,915	48,416	18,319	11,936	364
Percent in Wyo.	0.10	0.16	0.03	0.03	0.28
1970					
Reported Wyo. Cases	---	92	11	4	2
Reported U. S. Cases	2,888	56,797	22,096	13,845	346
Percent in Wyo.	---	0.16	0.05	0.03	0.58
1971					
Reported Wyo. Cases	1	52	2	8	---
Reported U. S. Cases	2,752	59,606	21,928	16,143	407
Percent in Wyo.	0.04	0.09	<0.01	0.05	---
Totals					
Reported Wyo. Cases	14	684	37	31	18
Reported U. S. Cases	29,644	450,066	173,293	128,939	4,415
Percent in Wyo.	0.05	0.15	0.02	0.02	0.41

* Includes serum hepatitis for years 1961 - 1965

Source: "Morbidity and Mortality Weekly Reports', Center for Disease Control,Atlanta,Ga.

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